

Atty. Docket No.: 021040-000300
 Applicant: Yan Zhou and Seng-Tiong Ho
 Title: INTEGRATED PLANAR COMPOSITE COUPLING STRUCTURES
 FOR BI-DIRECTIONAL LIGHT BEAM TRANSFORMATION...
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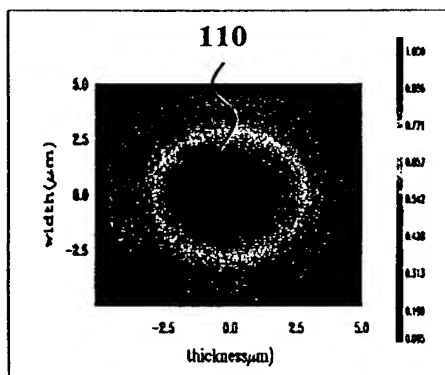


FIG 1 (a)

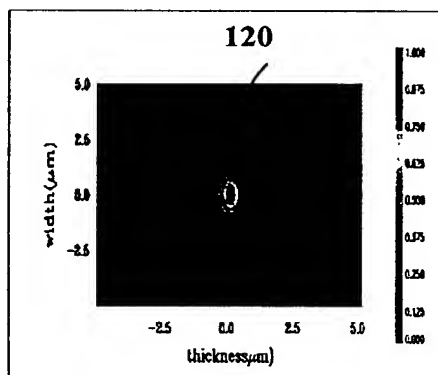
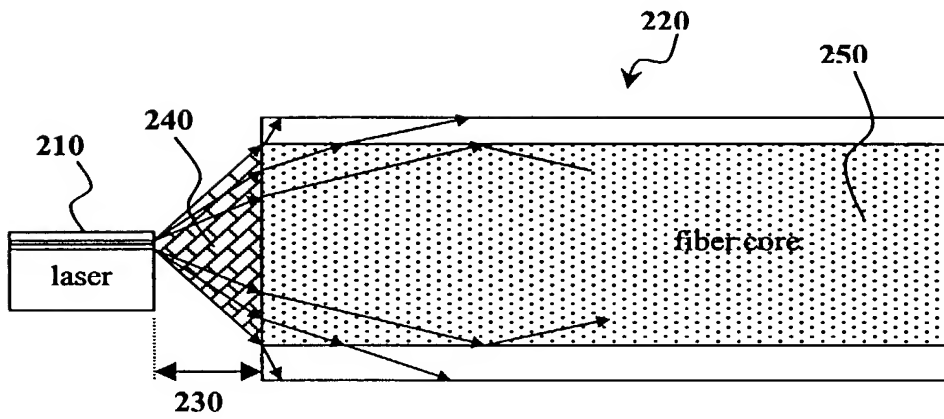


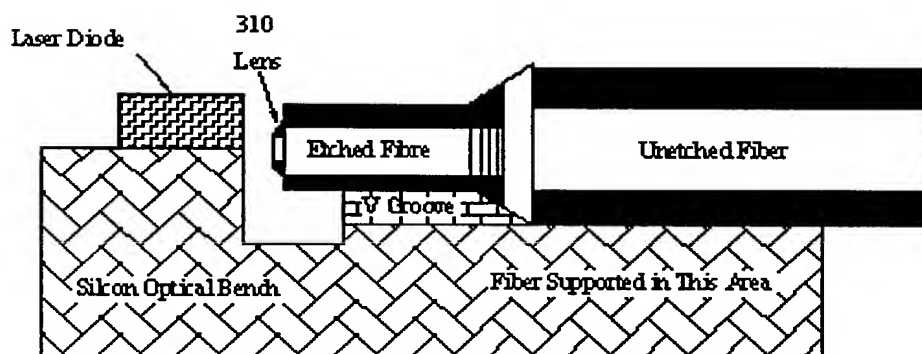
FIG 1 (b)



PRIOR ART

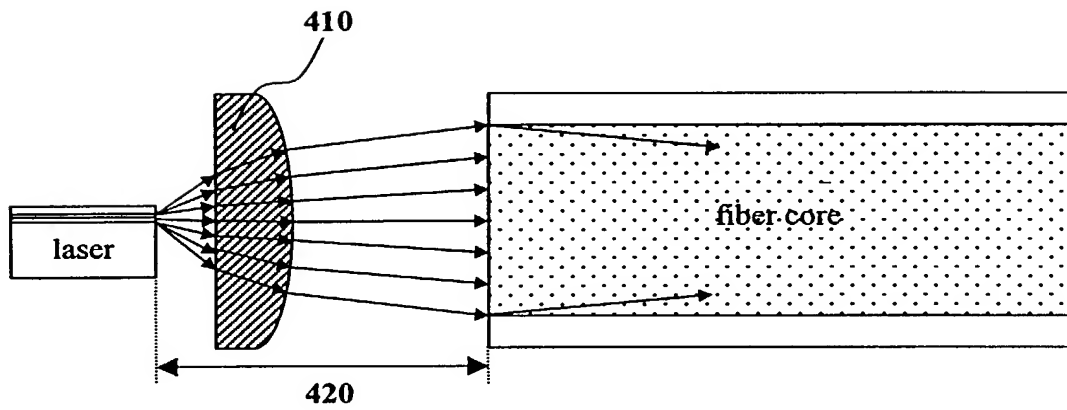
FIG 2

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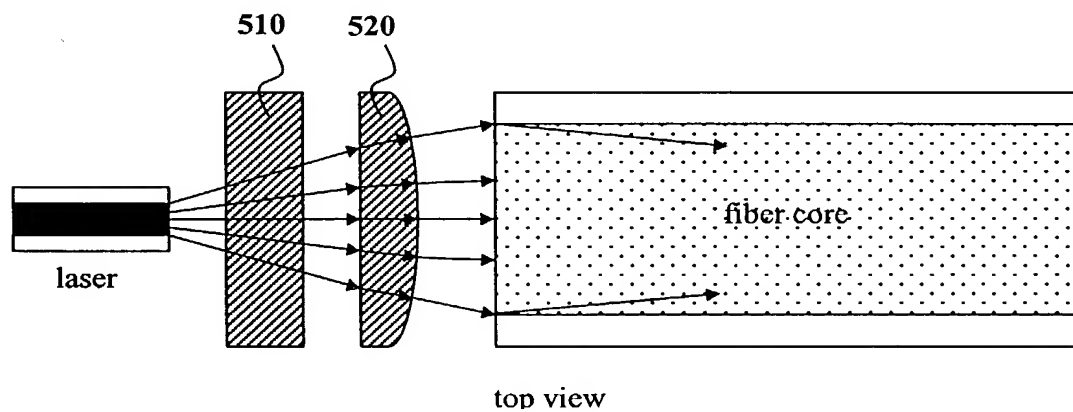
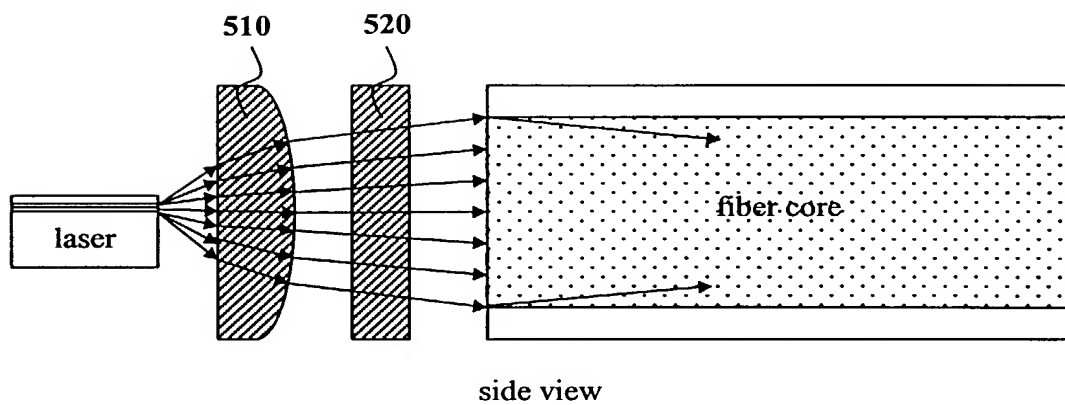
PRIOR ART

FIG. 3



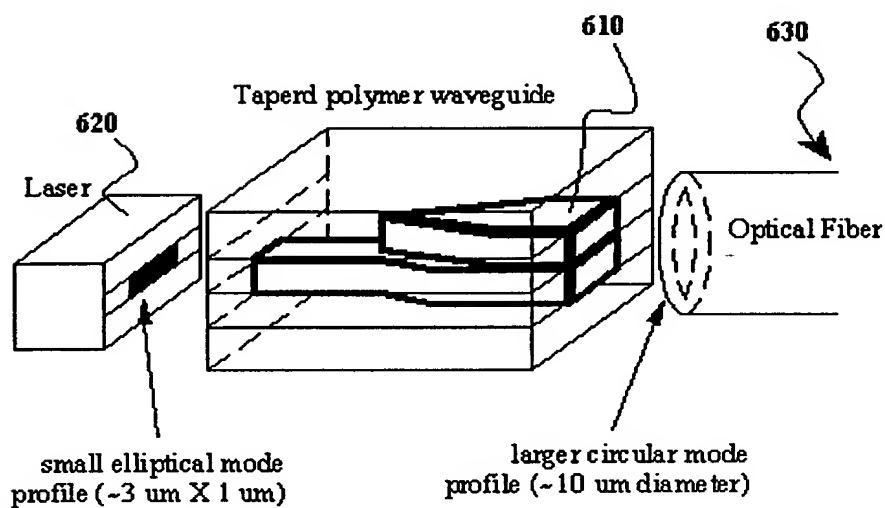
PRIOR ART

FIG. 4



PRIOR ART

FIG. 5



PRIOR ART

FIG. 6

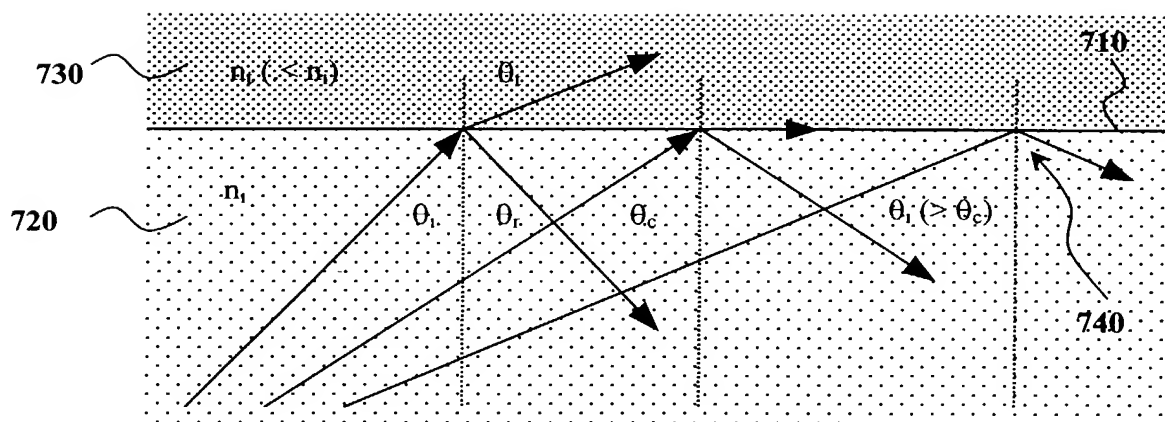


FIG 7

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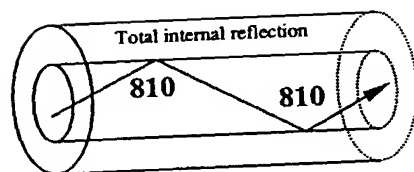


FIG 8

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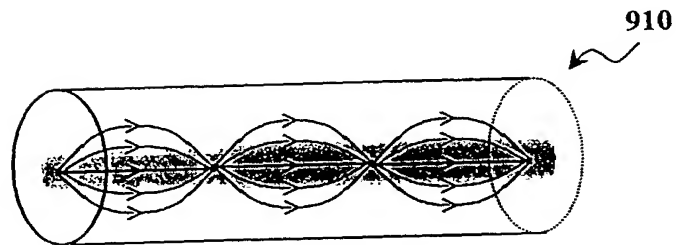


FIG 9

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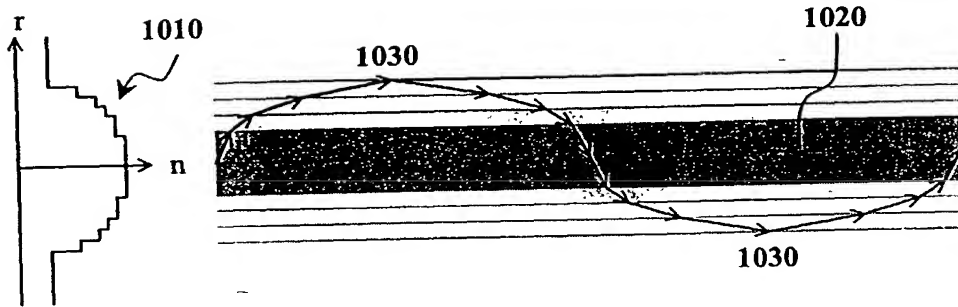


FIG 10

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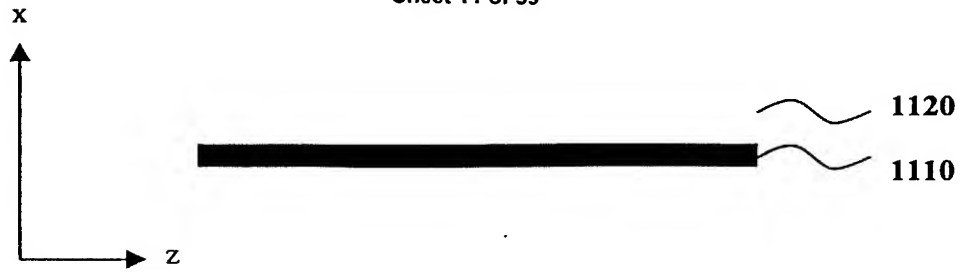


Fig 11A

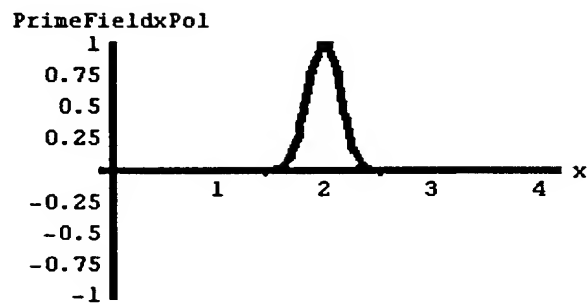


Fig 11B

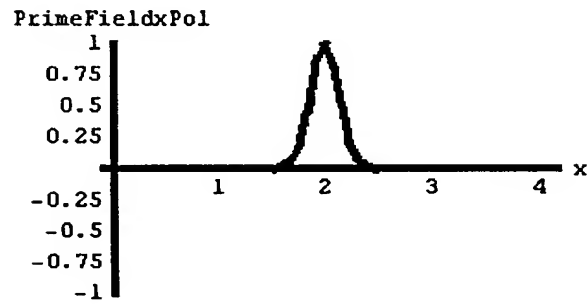


Fig 11C

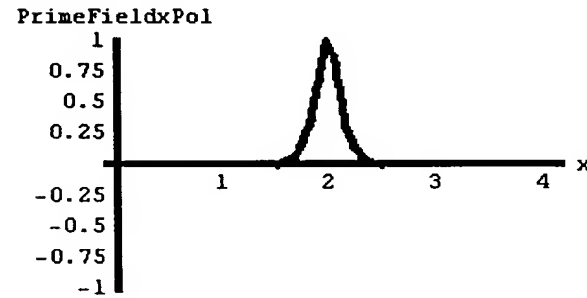


Fig 11D

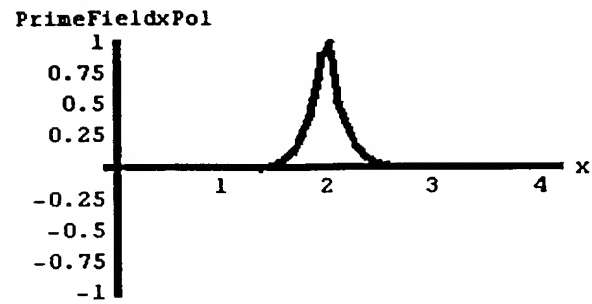


Fig 11E

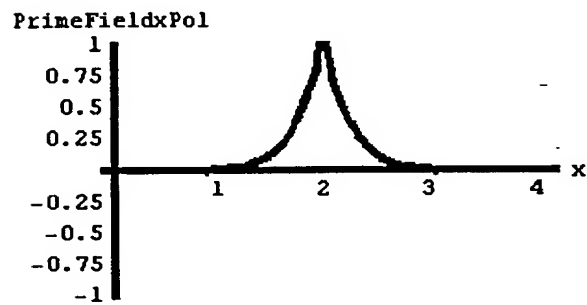


Fig 11F

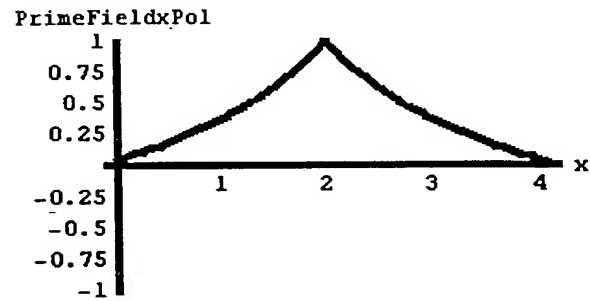


Fig 11G

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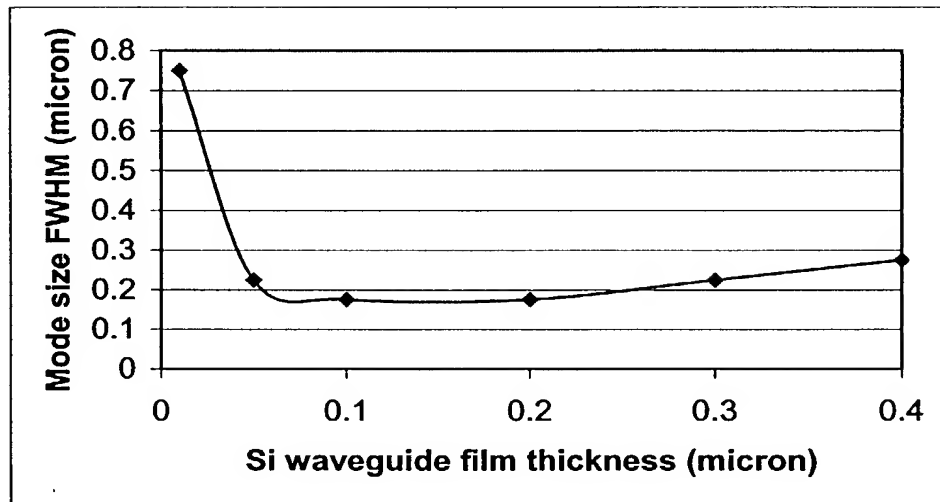
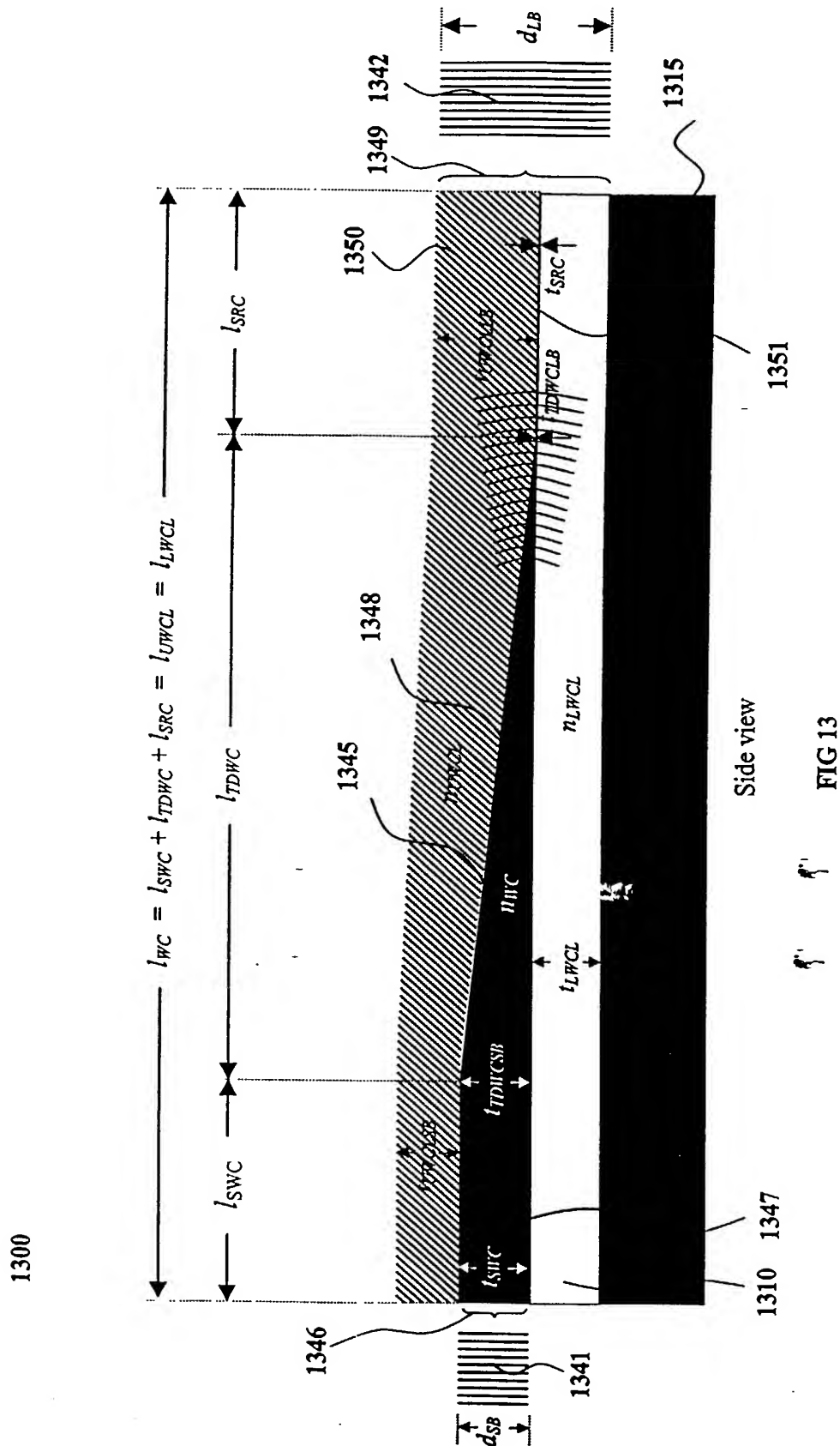


FIG. 12



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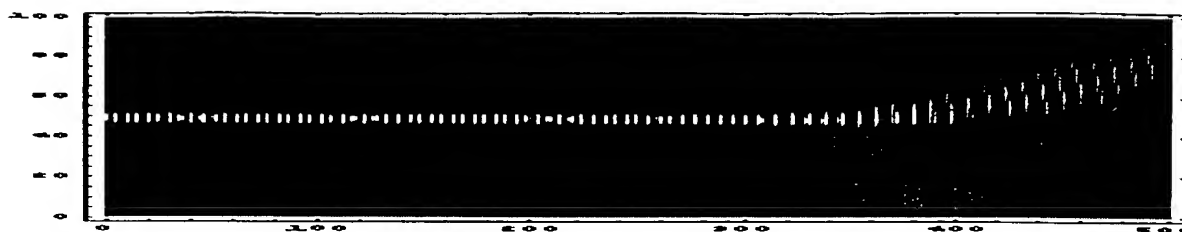


FIG 14

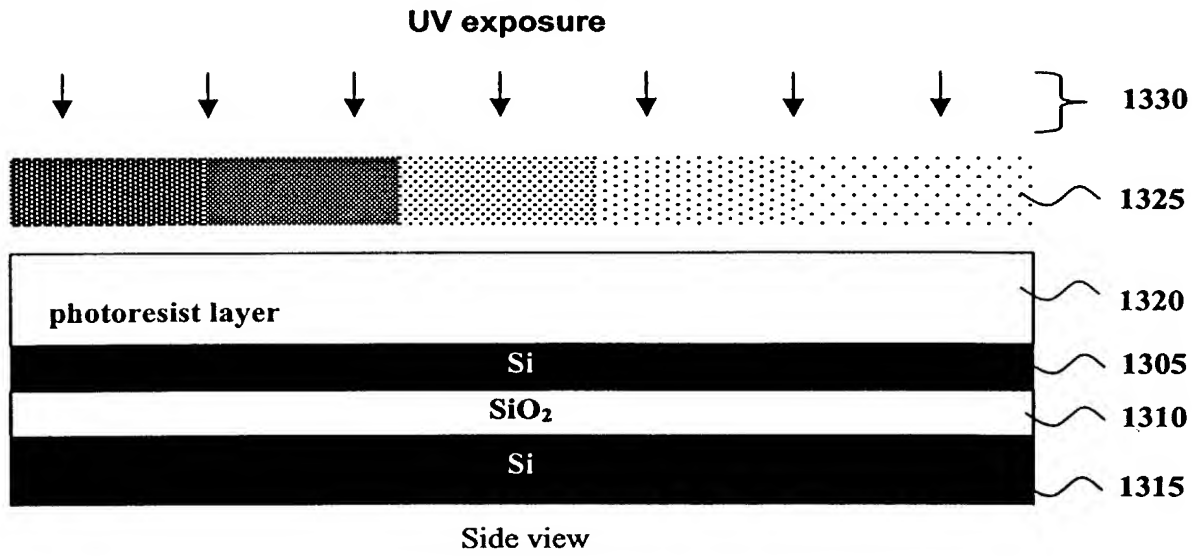


Fig 15A

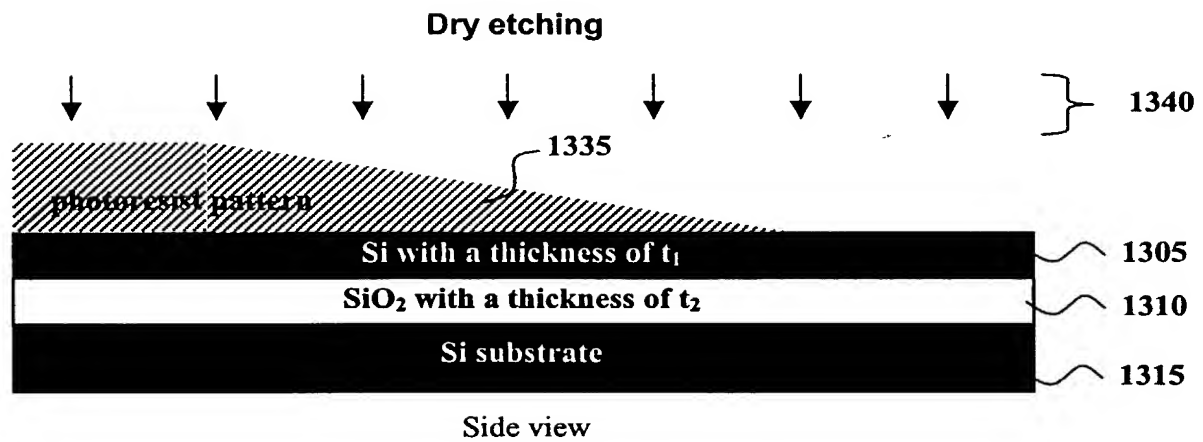


Fig 15B

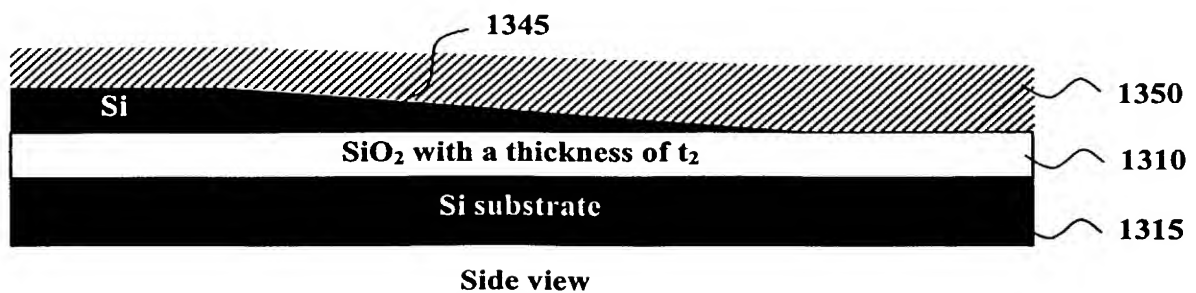


Fig 15C

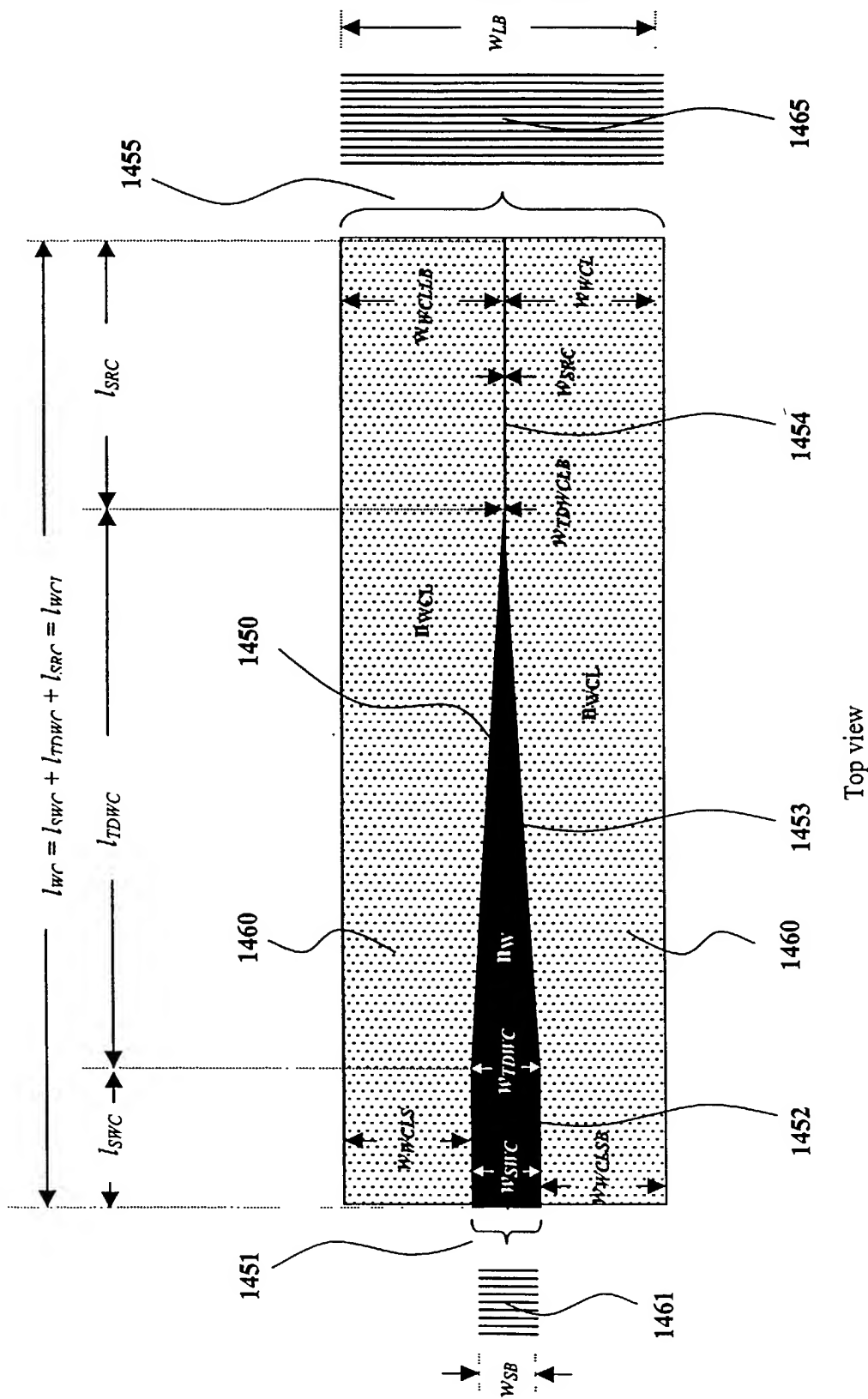


FIG. 16

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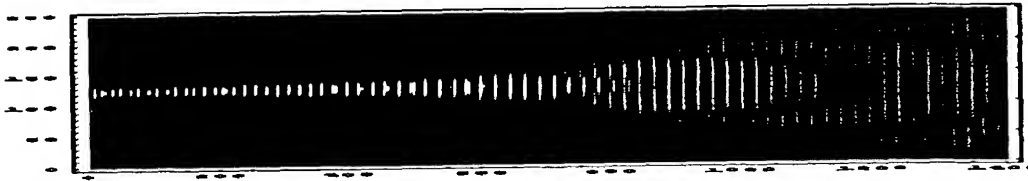
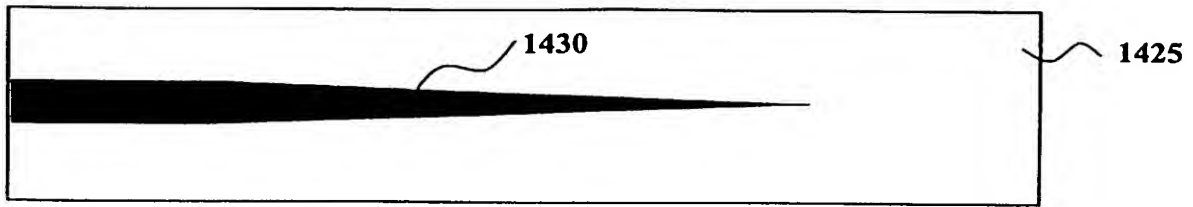


FIG 17

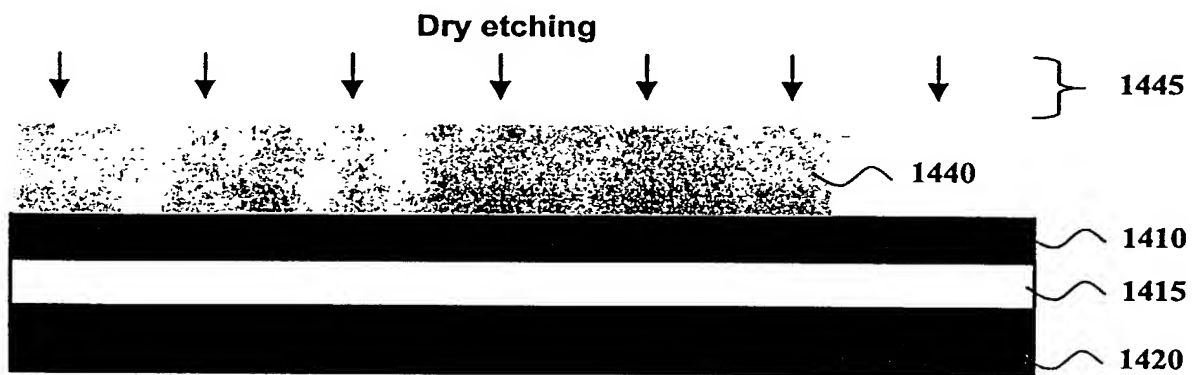


FIG. 19



Mask top view

Fig 18A



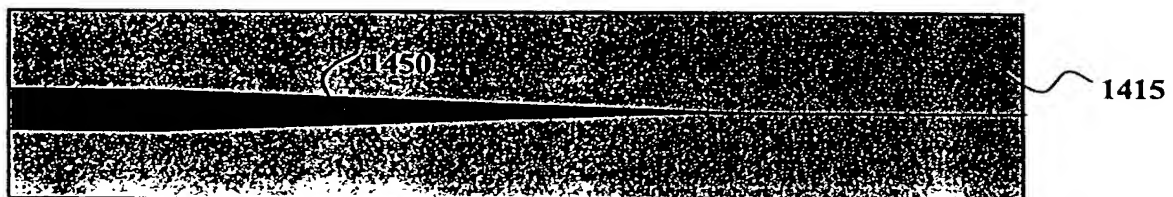
Side view

Fig 18B



Photoresist pattern top view

Fig 18C



Si tapered down/narrow section top view

Fig 18D

10083674, 052403

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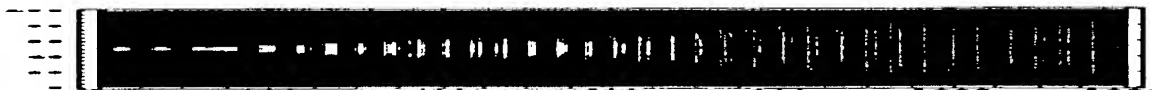
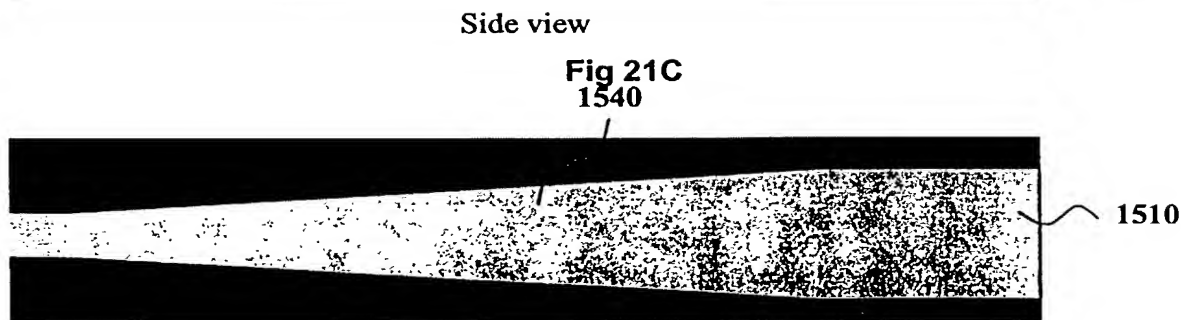
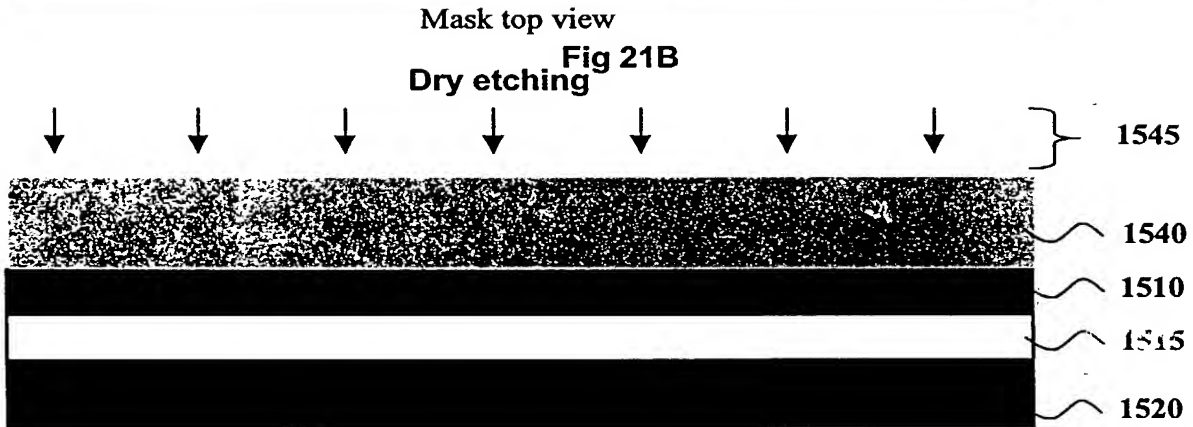
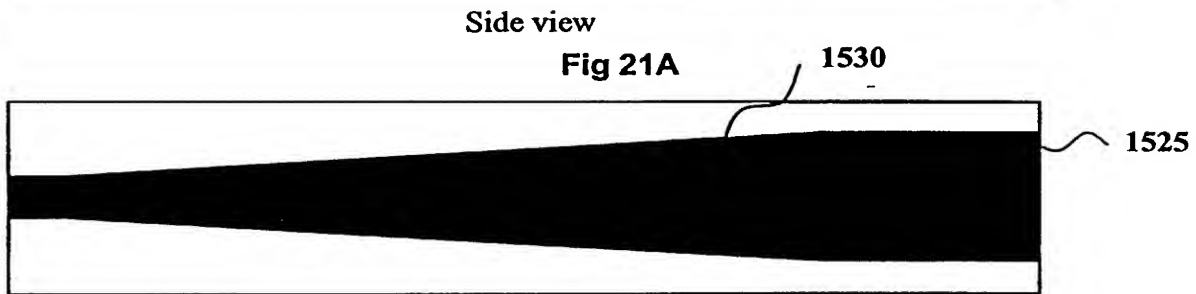
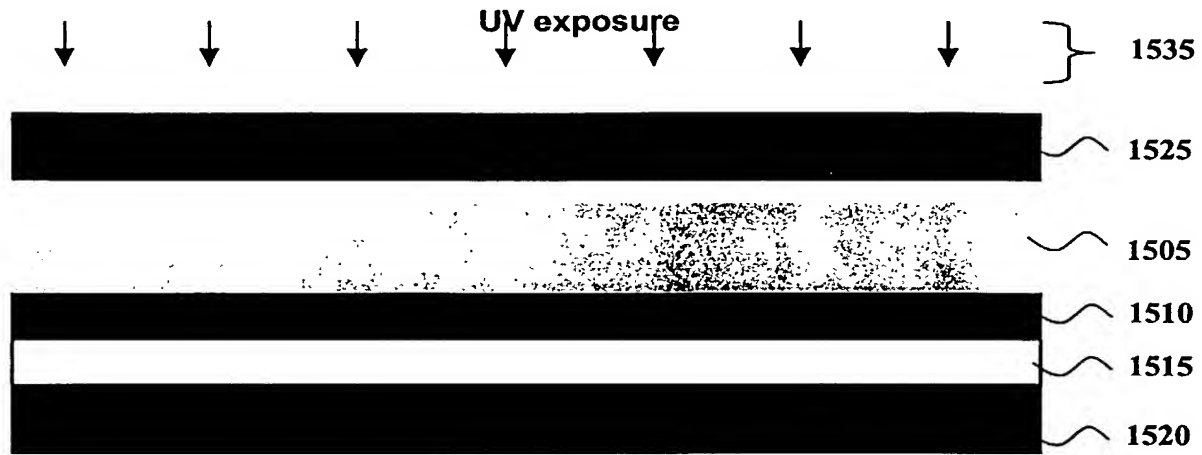
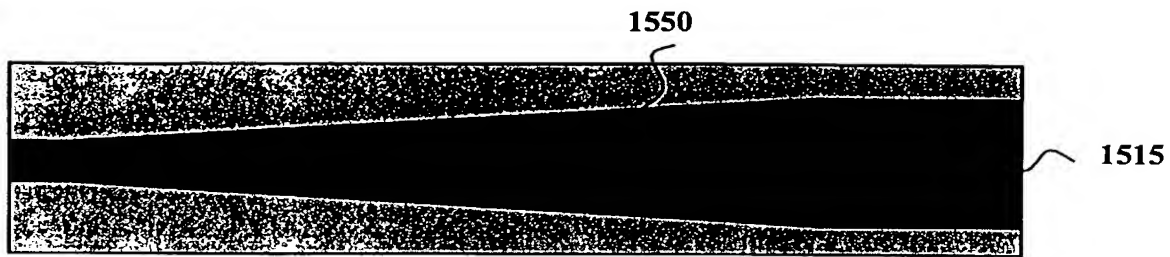


Fig. 20



Photoresist pattern top view Fig 21D

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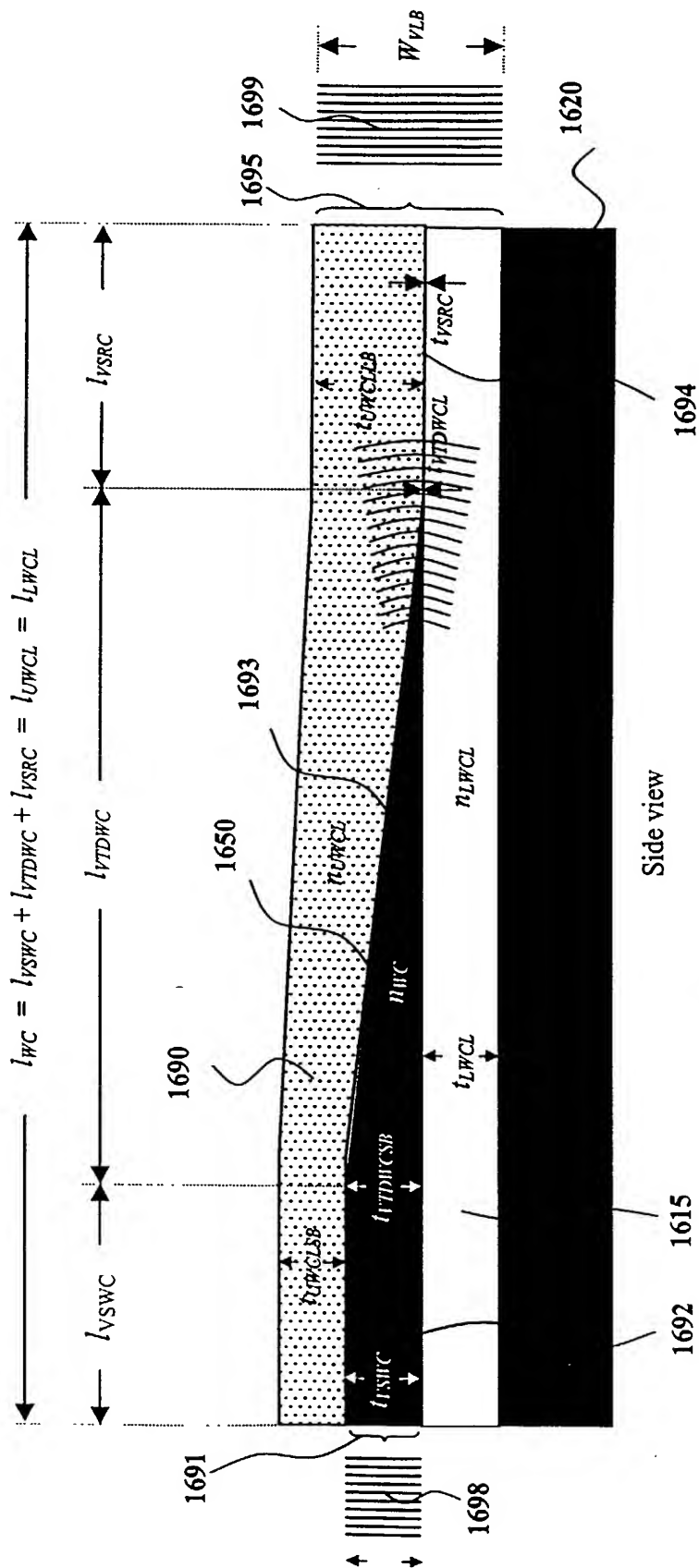


Si tapered up/wide section top view

FIG. 21E

FIG. 22A

1600



Side view

FIG 22B

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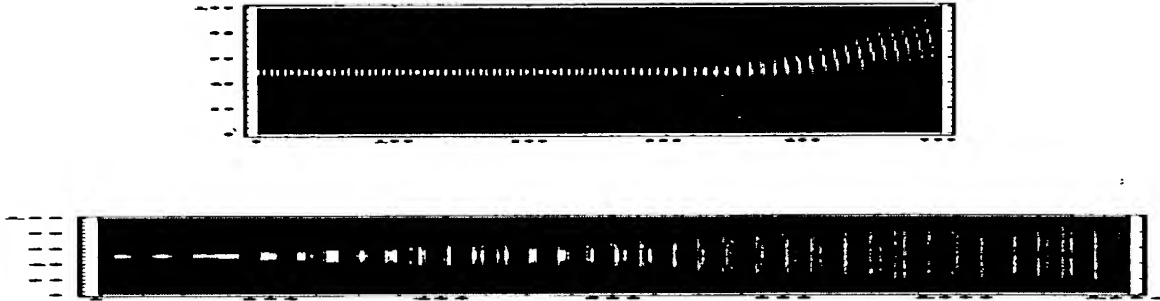
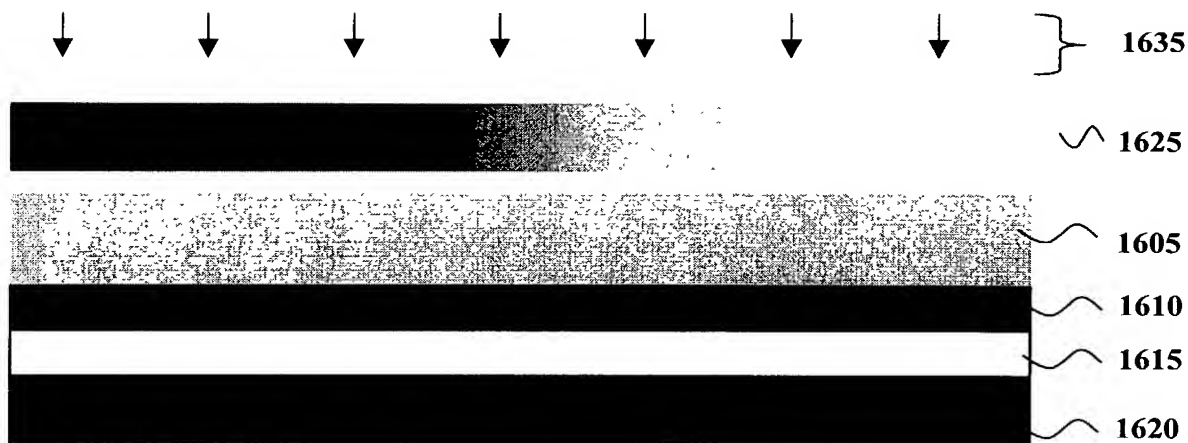
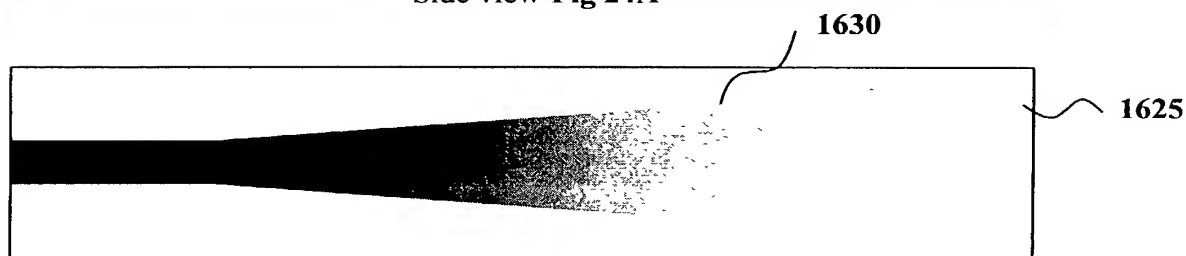


FIG 23

UV exposure

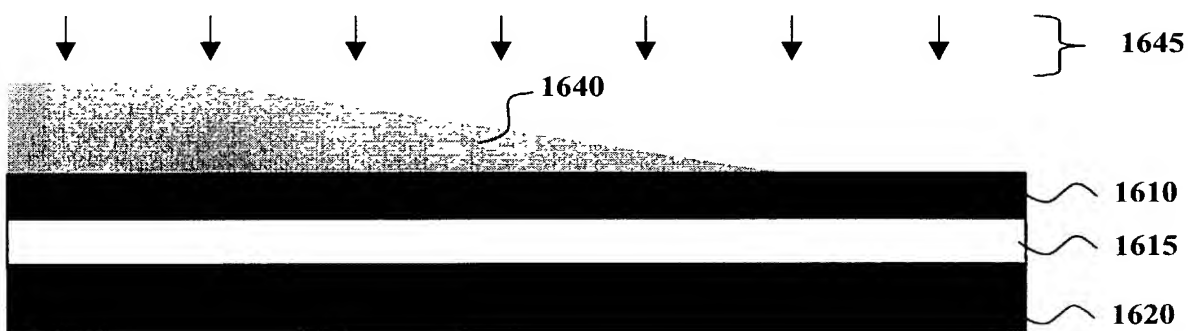


Side view-Fig 24A

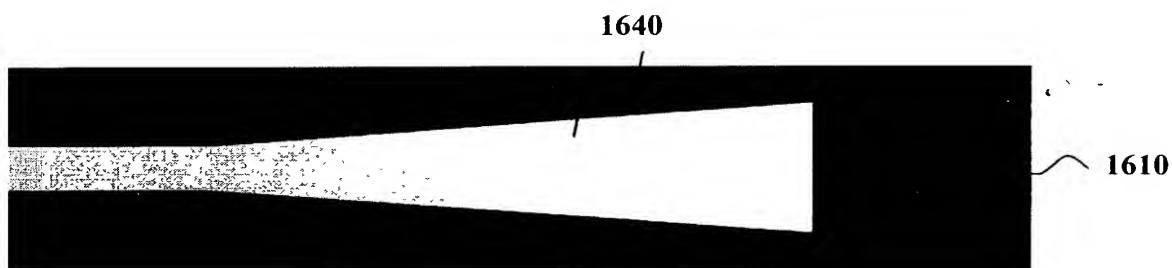


Mask top view-Fig 24B

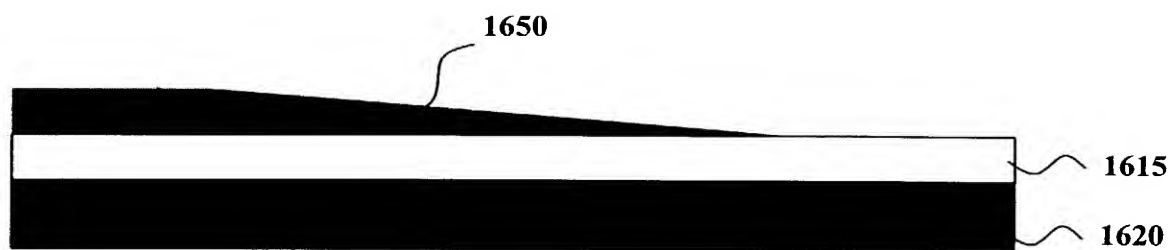
Dry etching



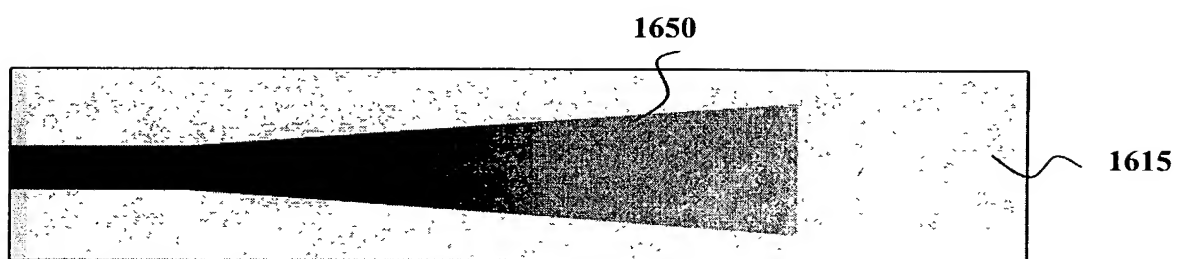
Side view-FIG 24C



Photoresist pattern top view-FIG24D



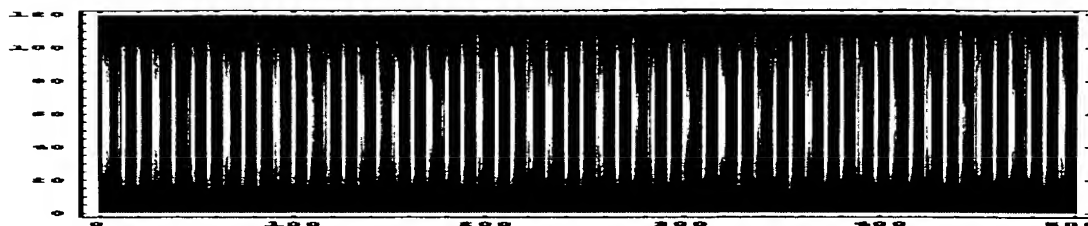
Side view-FIG24E



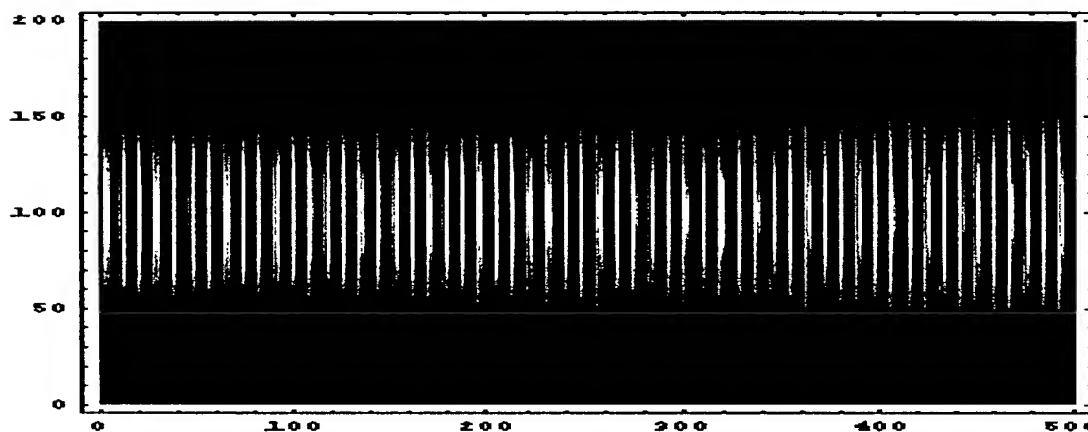
Si tapered up/wide section top view

FIG. 24F

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side view



top view

FIG 26

FIG 27A

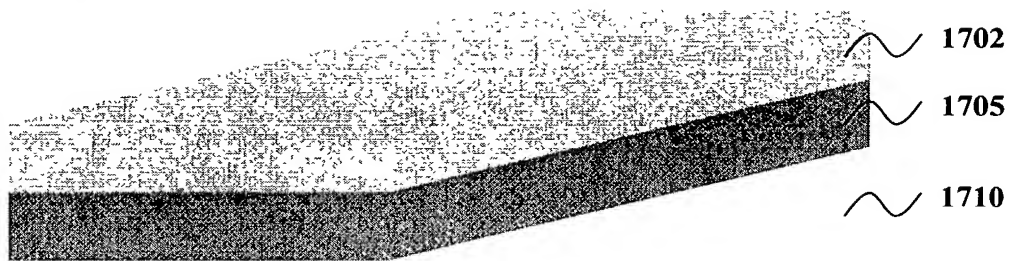


FIG 27B

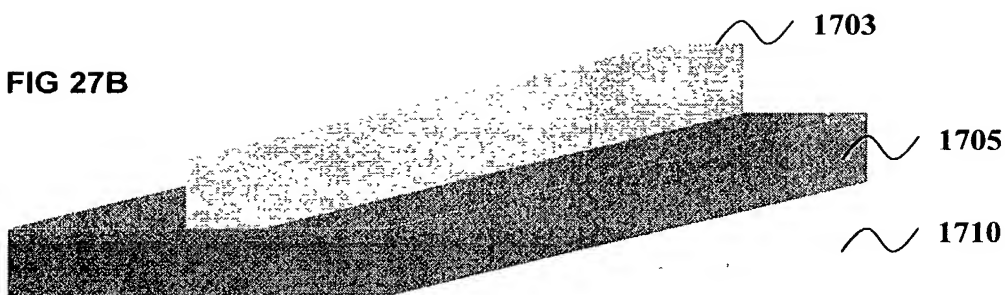


FIG 27C

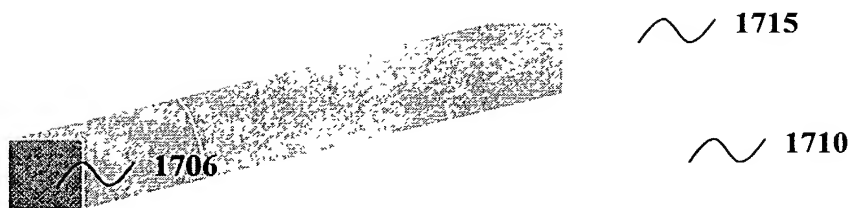
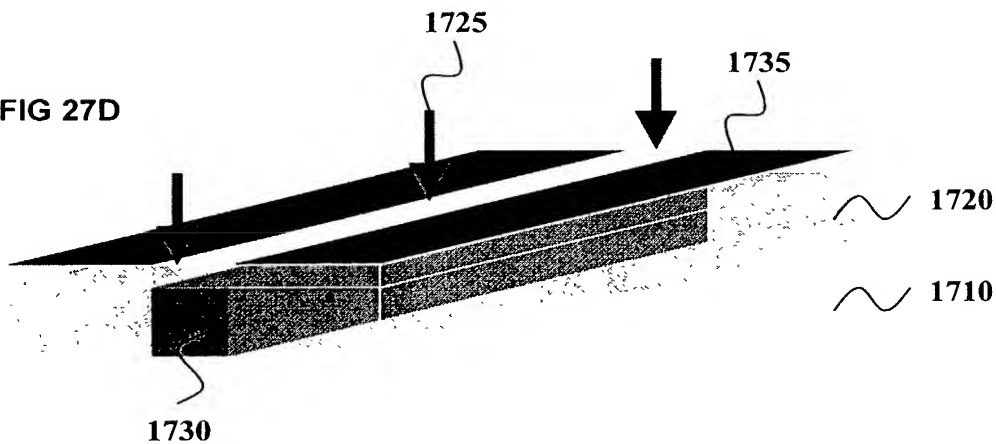


FIG 27D



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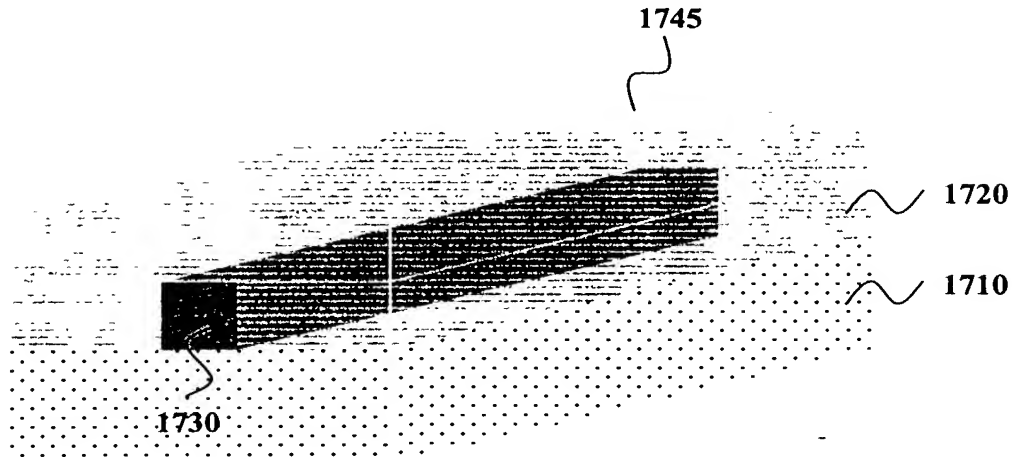


FIG. 27E

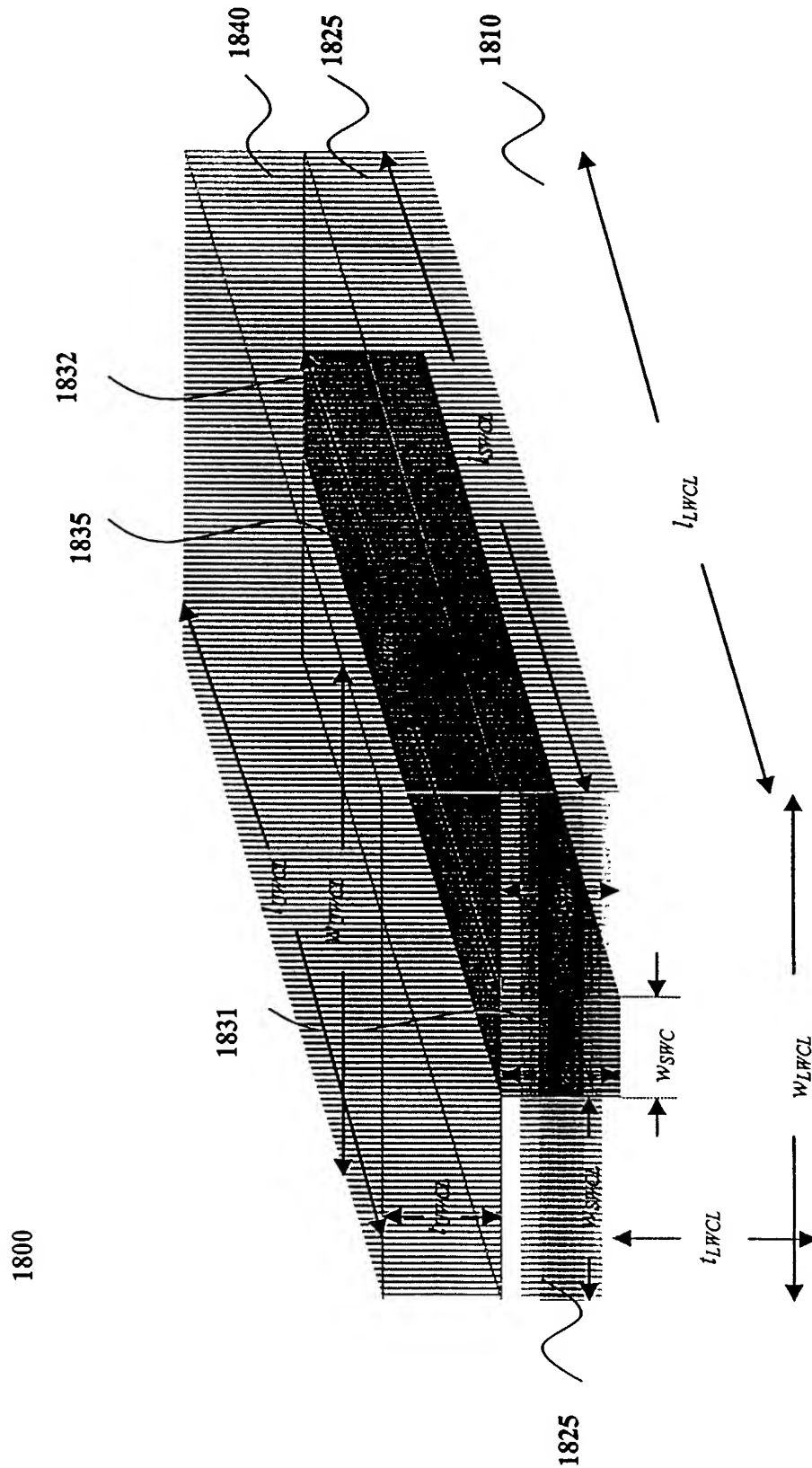
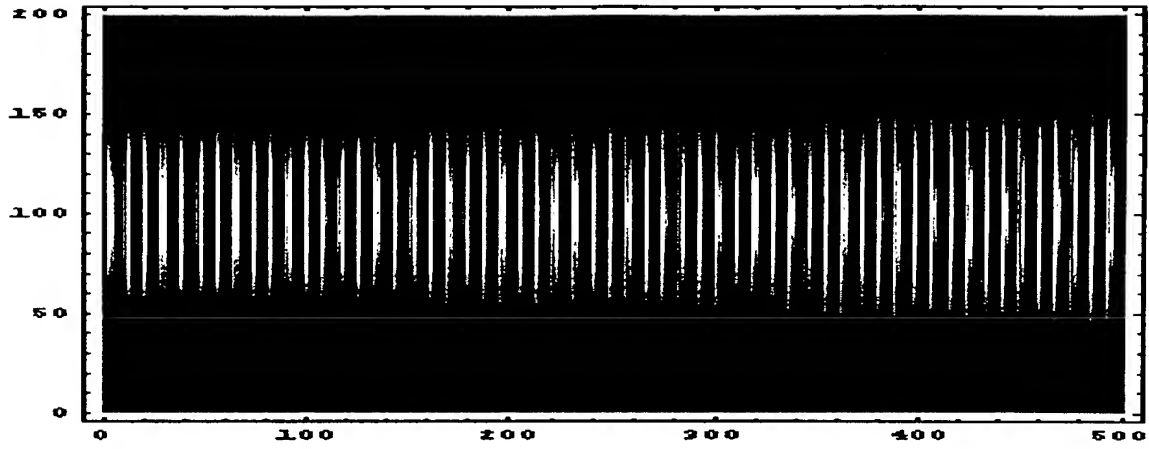
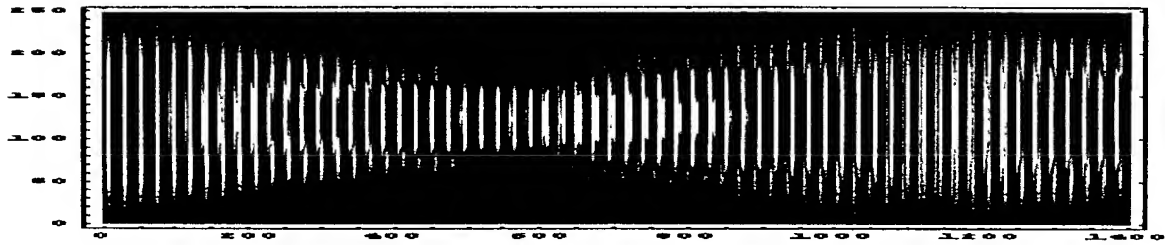


FIG 28



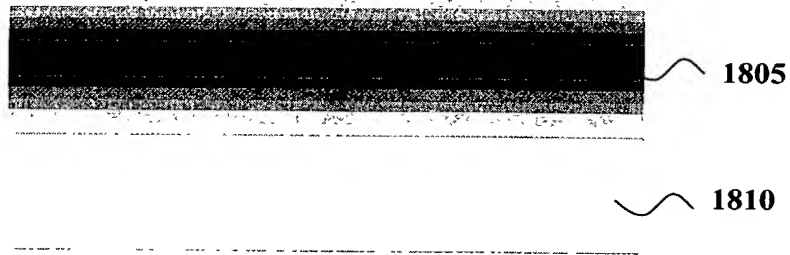
top view



side view

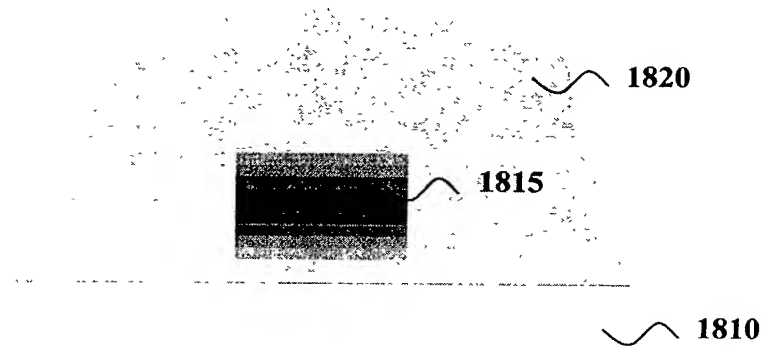
Fig 29

FIG 30A



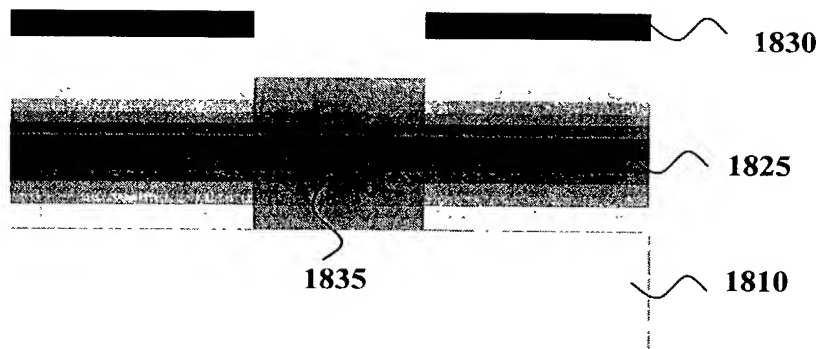
Cross sectional view

FIG 30B



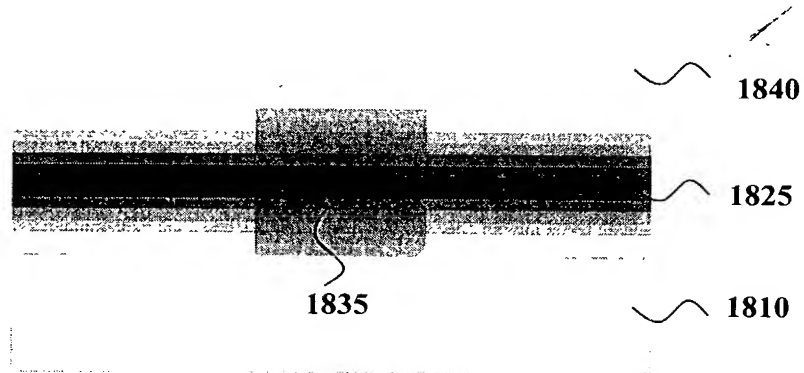
Cross sectional view

FIG 30C



Cross sectional view

FIG 30D



Cross sectional view

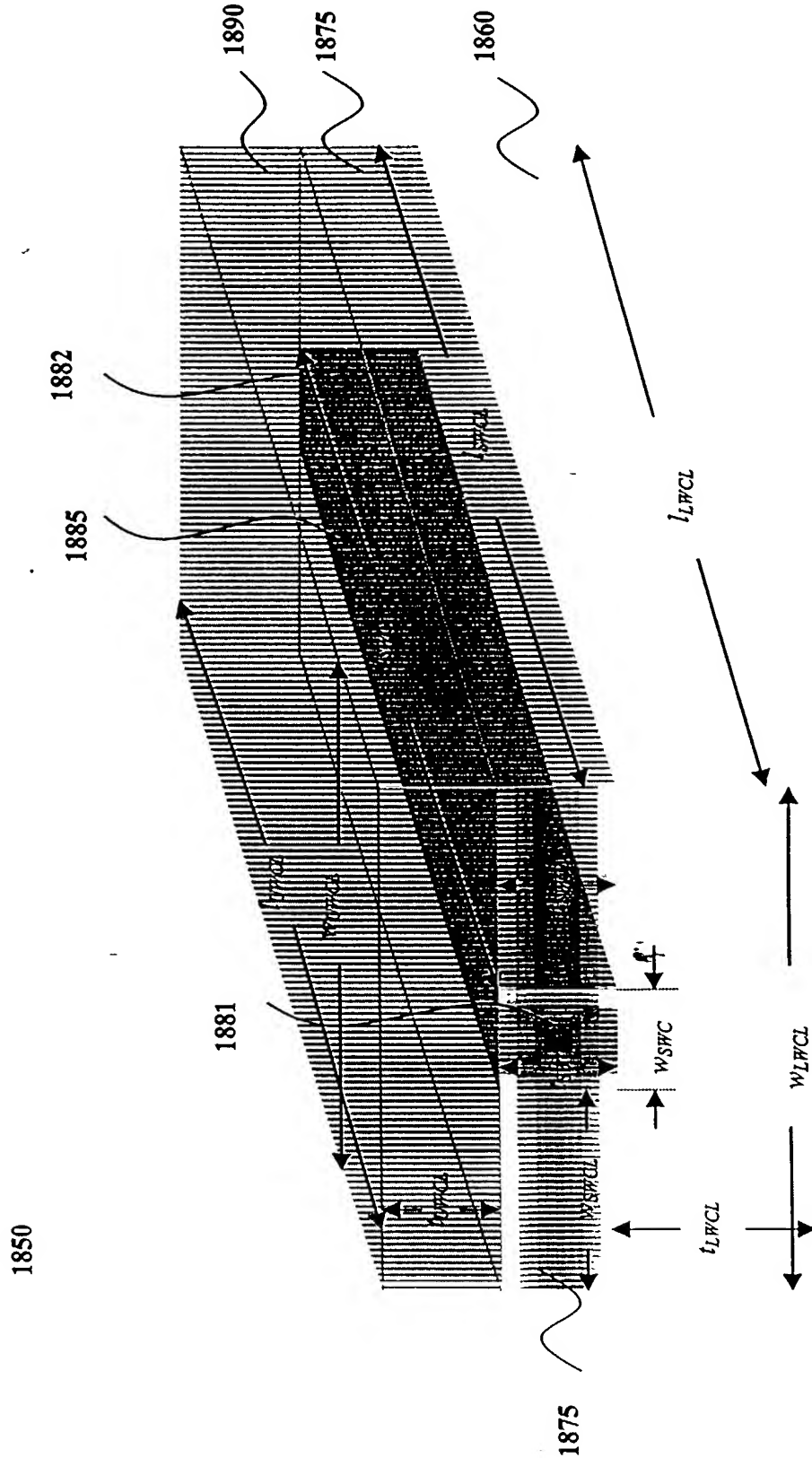
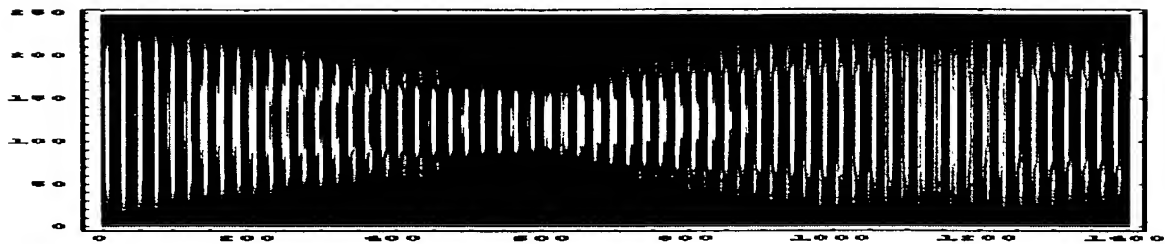
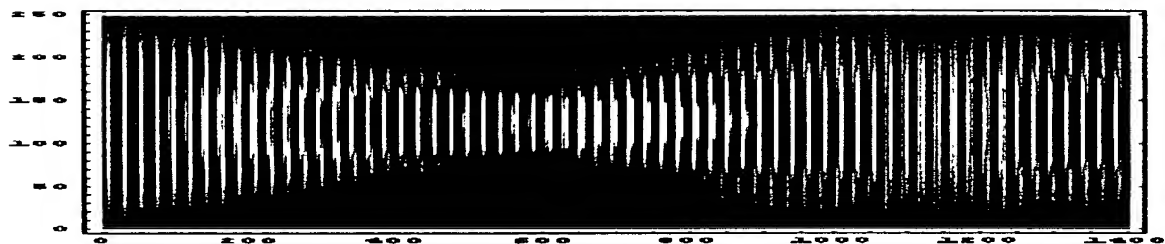


FIG 31

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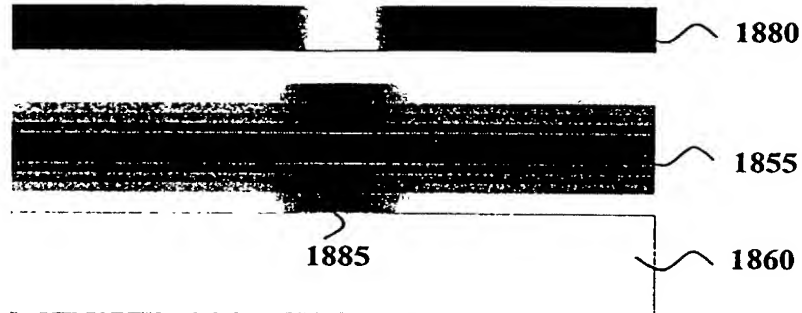
top view



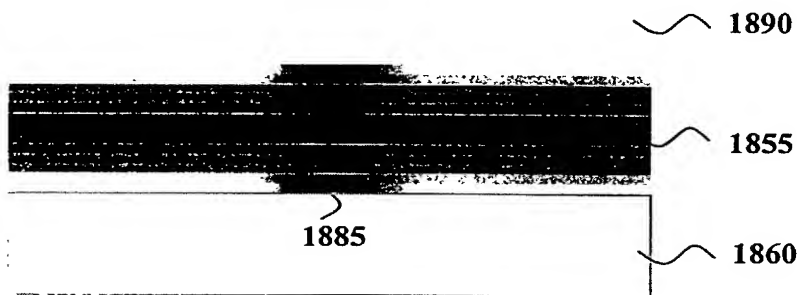
side view

Fig 32

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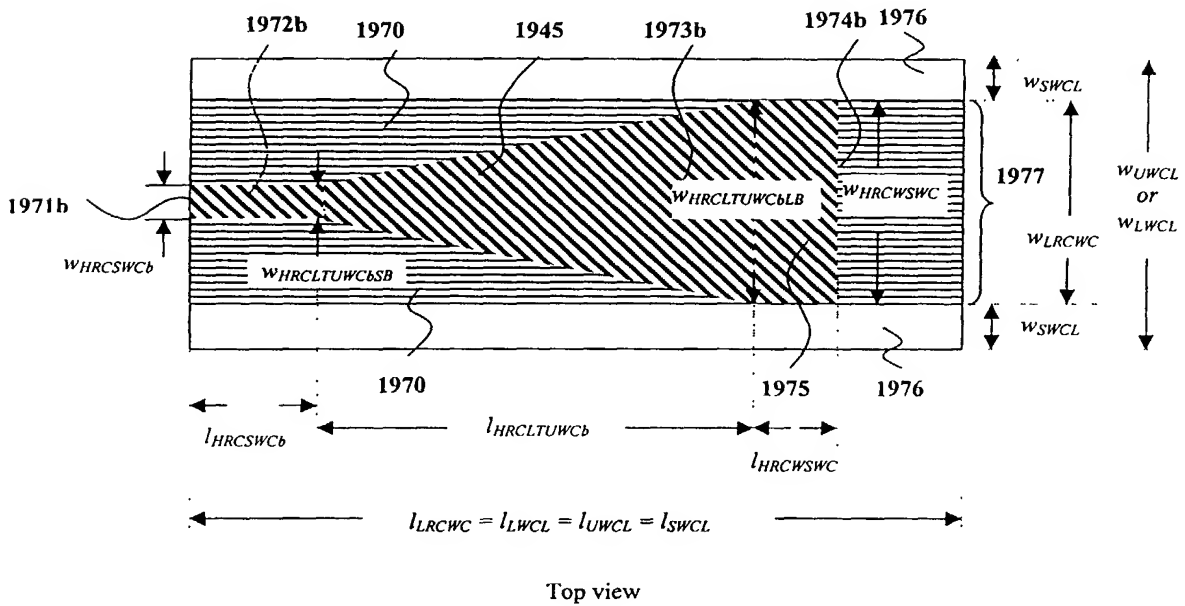
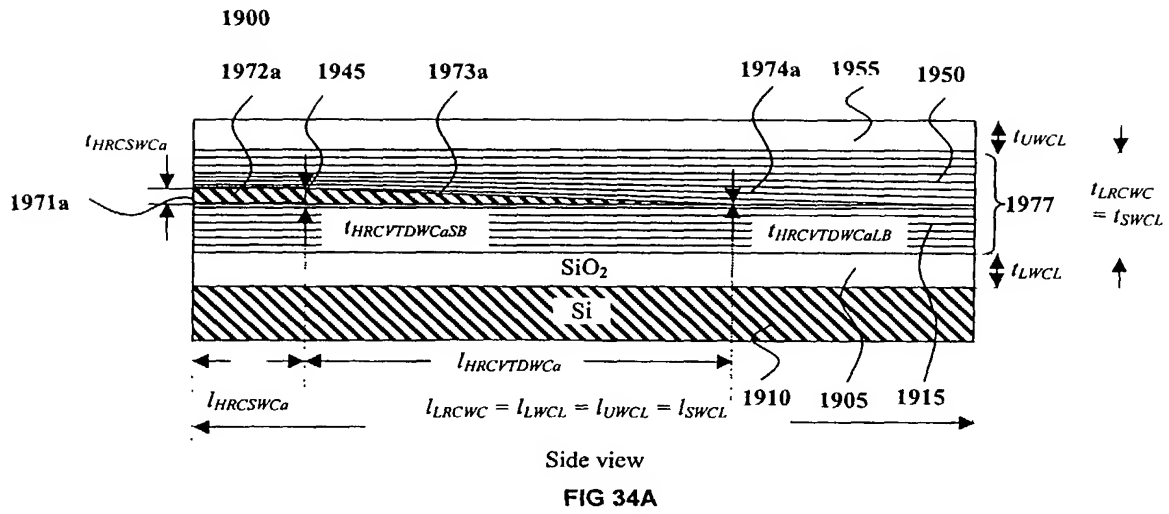


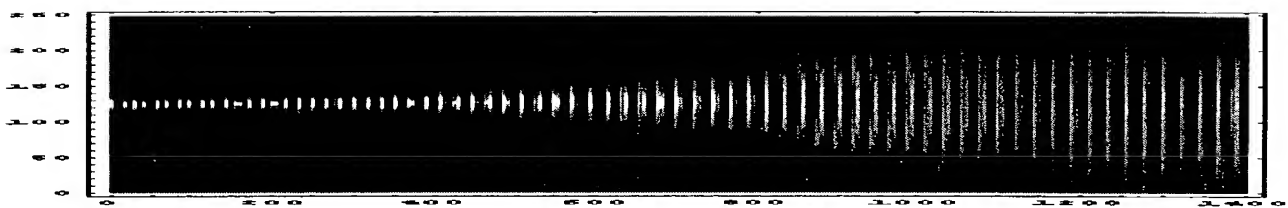
Cross sectional view
 FIG 33A



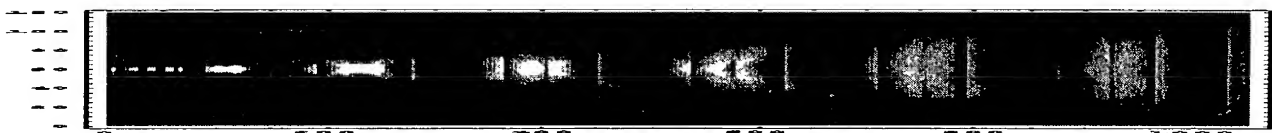
Cross sectional view

FIG. 33B





Side view



Top view

FIG 35

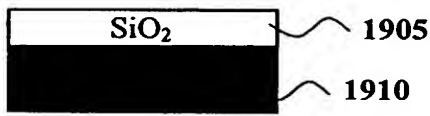


FIG 36A

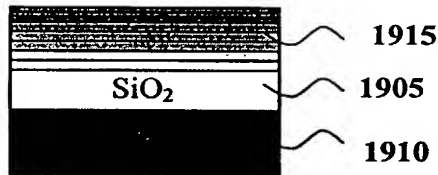


FIG 36B

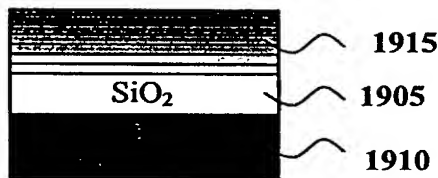


FIG 36C

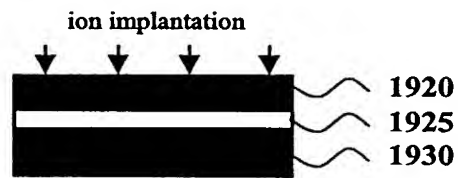


FIG 36D

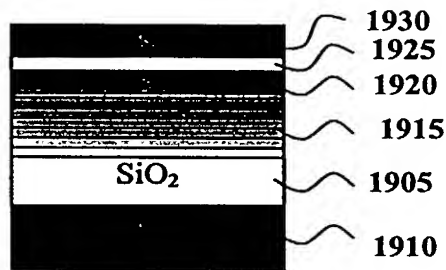


FIG 36E

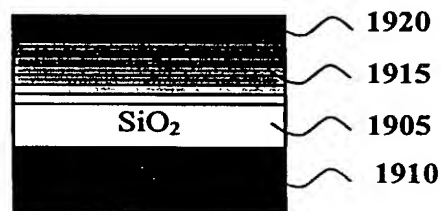
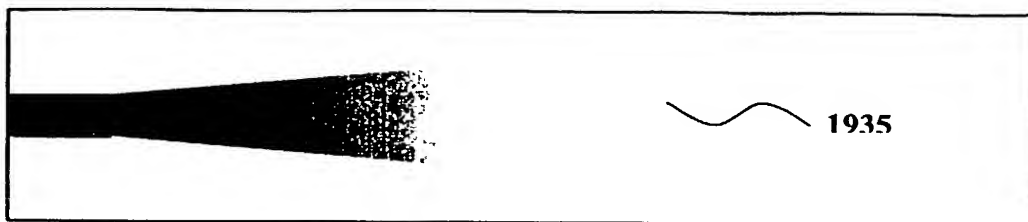
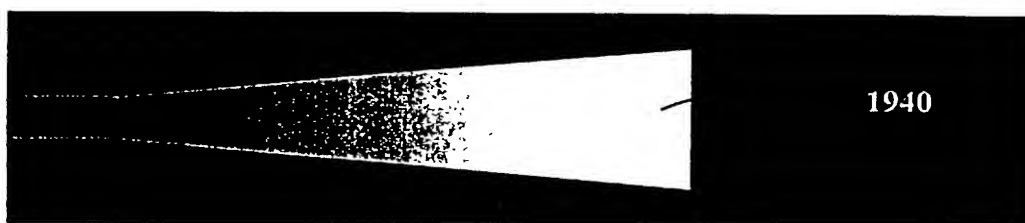


FIG 36F

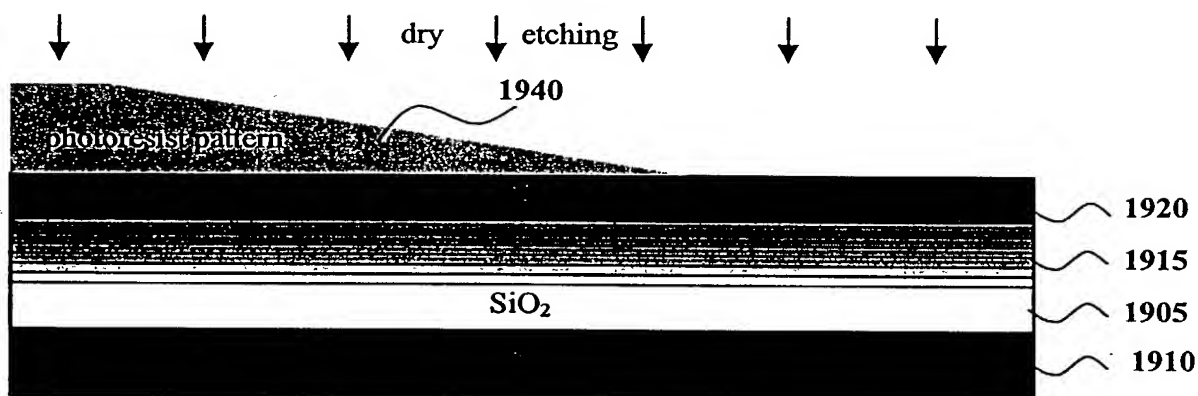


Mask top view
FIG 36G

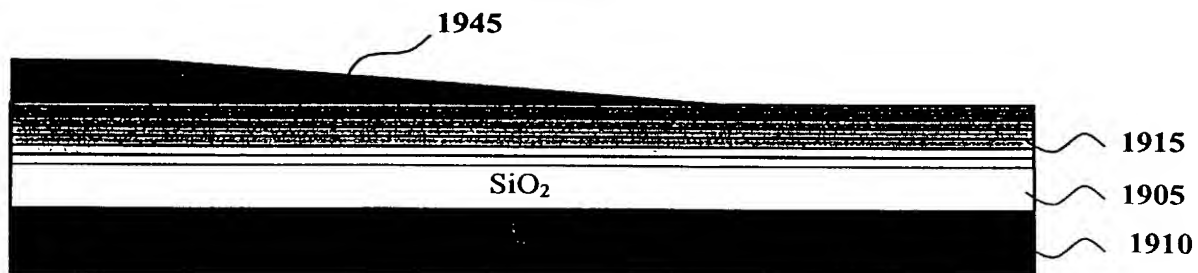


photoresist pattern top view

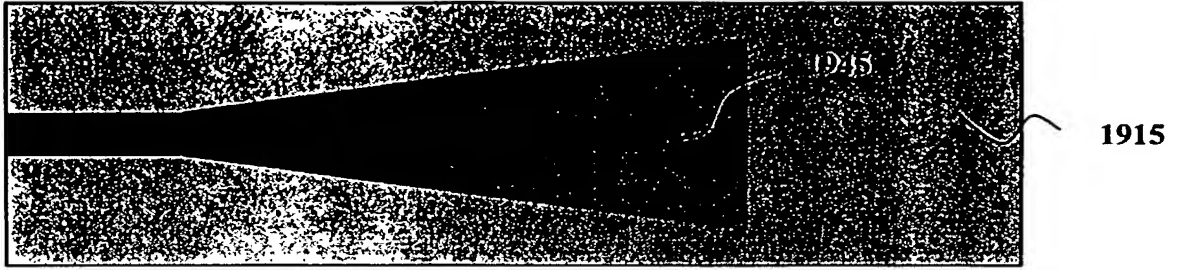
FIG 36H



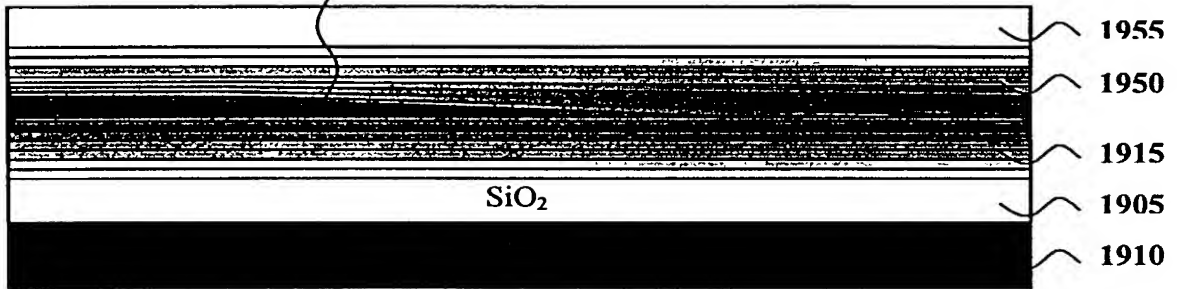
Side view
FIG 36I



Side view
FIG 36J



Top view
 FIG 36K

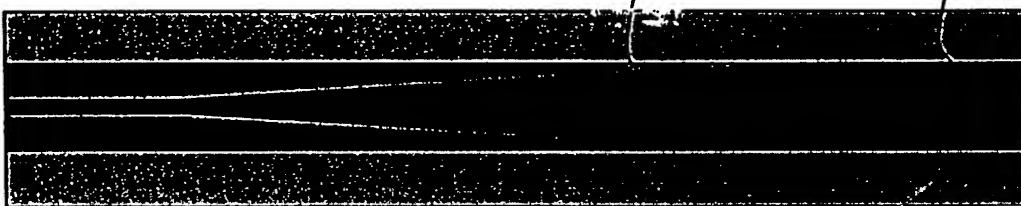


Side view
 FIG 36L



mask

FIG 36M



Top view
 FIG. 36N

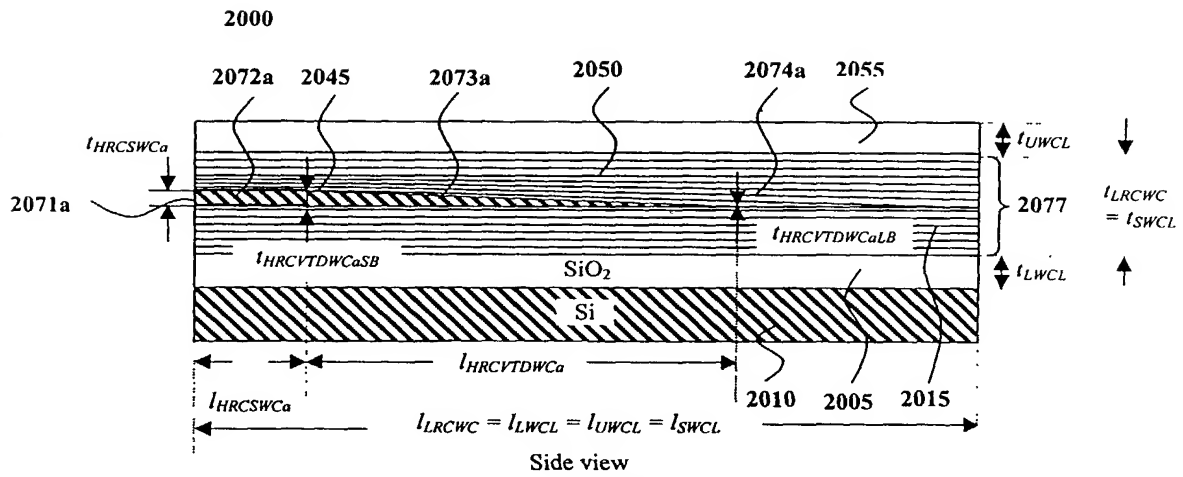


FIG 37A

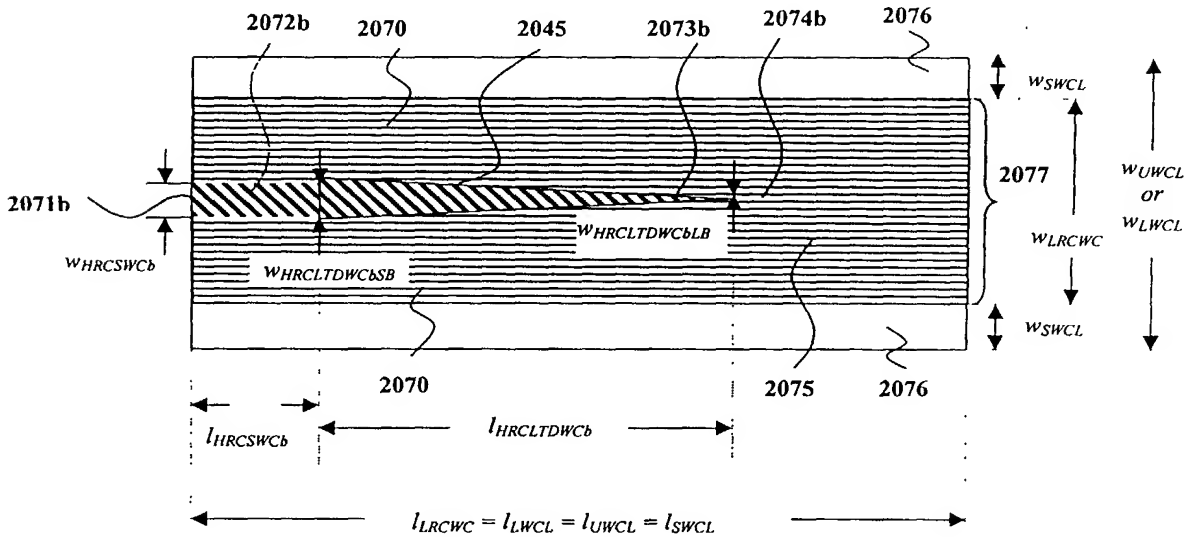


FIG 37B

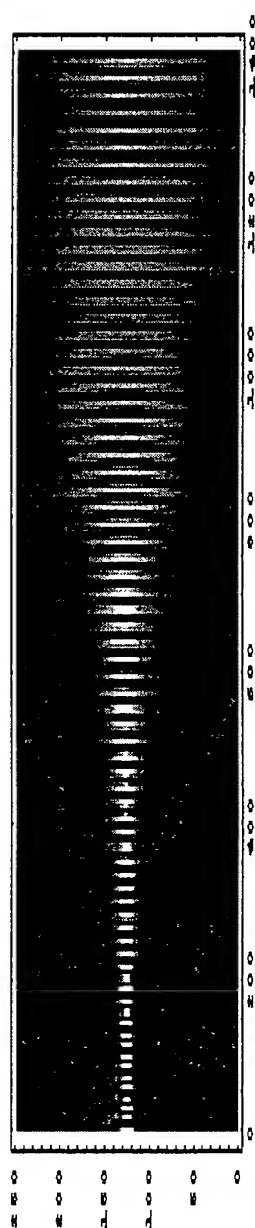


FIG 38

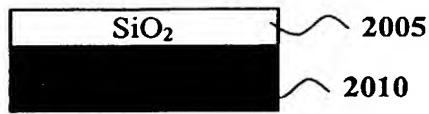


FIG 39A

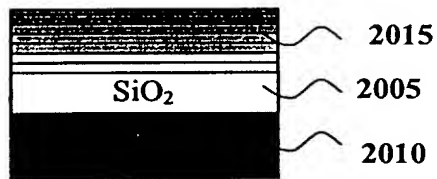


FIG 39B

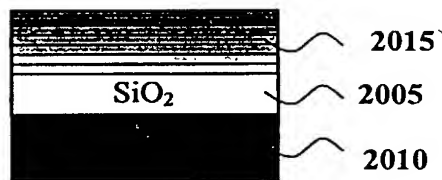


FIG 39C

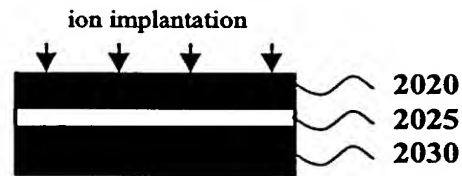


FIG 39D

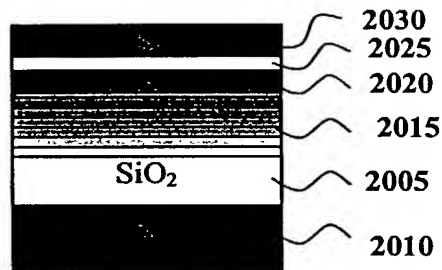


FIG 39E

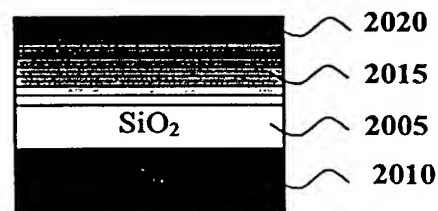
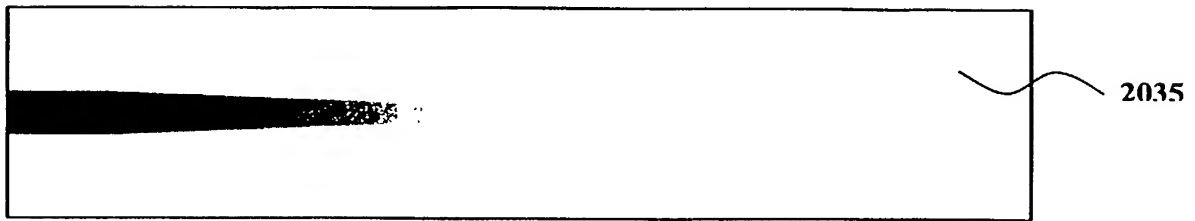


FIG 39F

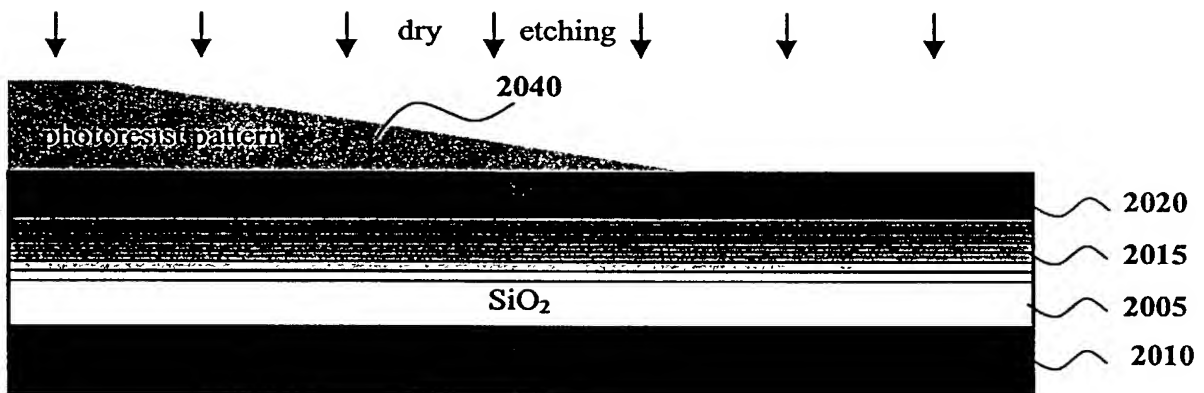


Mask top view
FIG 39G

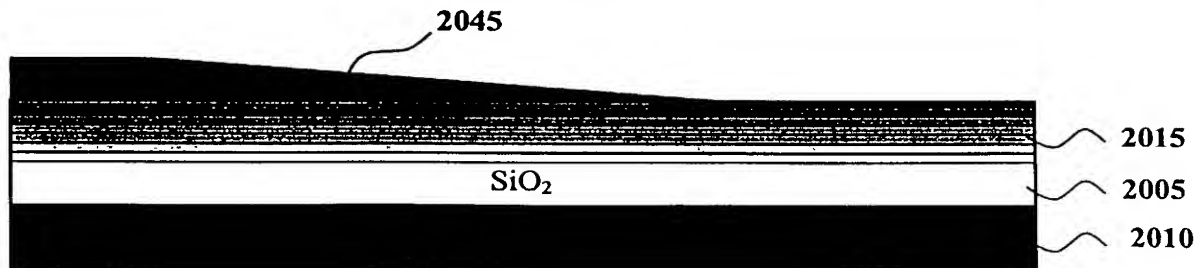


photoresist pattern top view

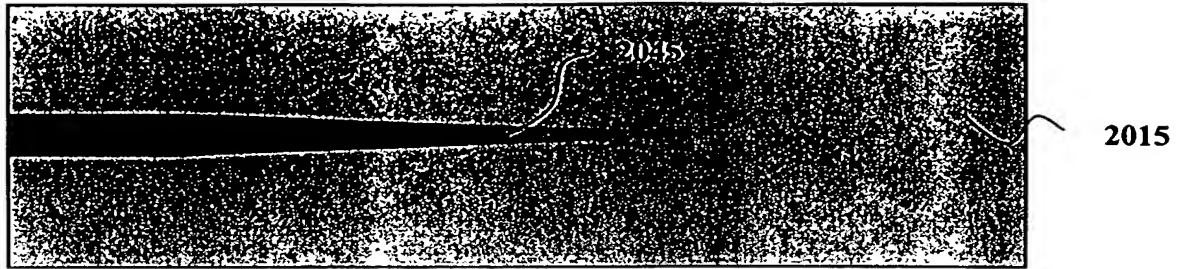
FIG 39H



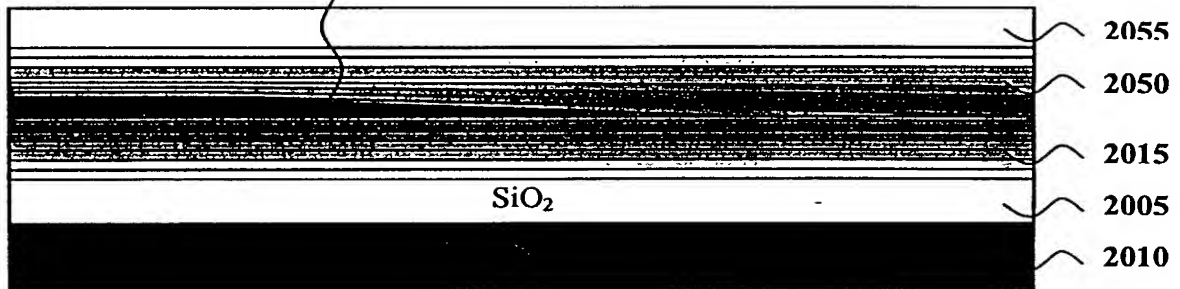
Side view
FIG 39I



Side view
FIG 39J



Top view
 FIG 39K

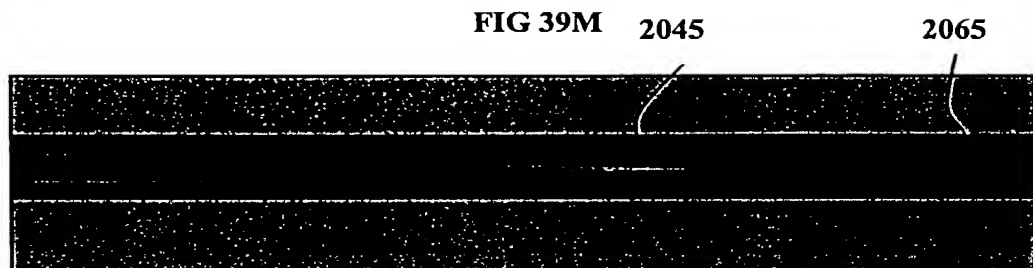


Side view
 FIG 39L



mask

FIG 39M

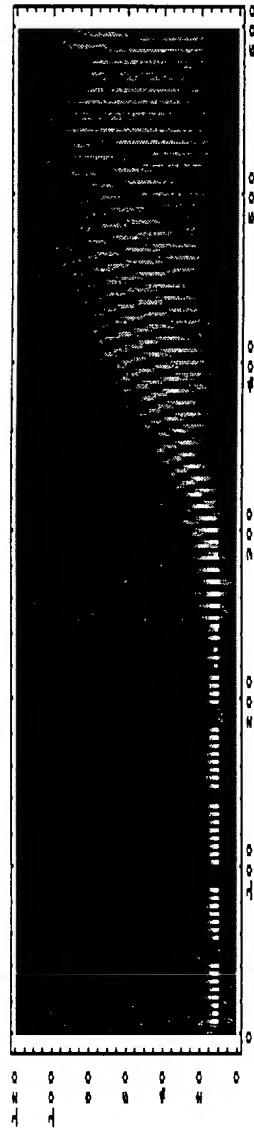


Top view
 FIG. 39N

Figure 1 is a schematic diagram of a multi-layered structure, labeled 71b. The structure is composed of several layers, some of which are hatched with different patterns. The layers are labeled with reference numerals: 2172b, 2155, 2145, 2173b, 2174b, and 2176b. A central region is labeled 2177. The diagram shows various dimensions and thicknesses. The horizontal dimensions are labeled as $l_{HRCSWCb}$, $l_{HRCLTUWCb}$, $l_{HRCWSWC}$, and $l_{LRCWC} = l_{LWCL} = l_{UWCL} = l_{SWCL}$. The vertical dimensions are labeled as w_{SWCL} , w_{UWCL} or w_{LWCL} , and w_{LRWC} . Arrows indicate the direction of forces or displacements.



FIG 40C



Taper side launching



GRIN guide side launching

FIG 41

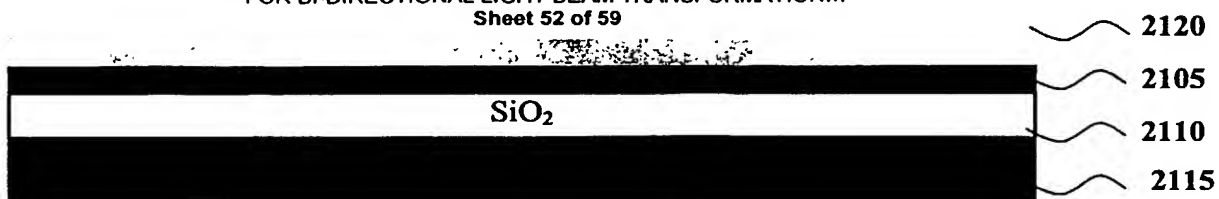
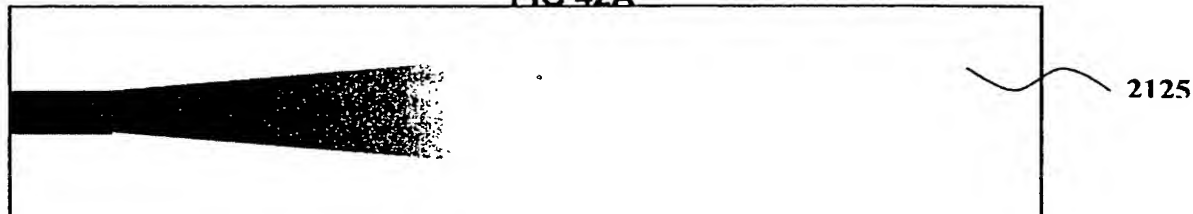
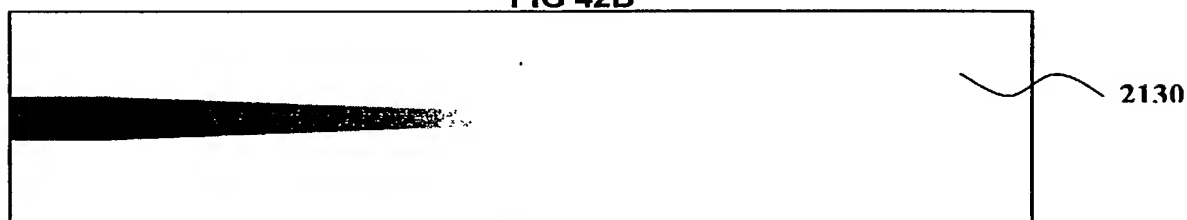


FIG 42A



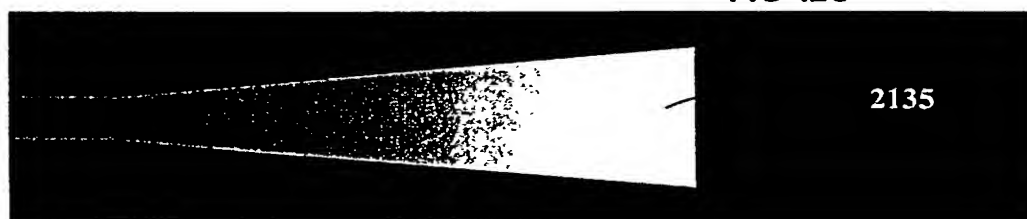
Mask top view

FIG 42B



Mask top view

FIG 42C



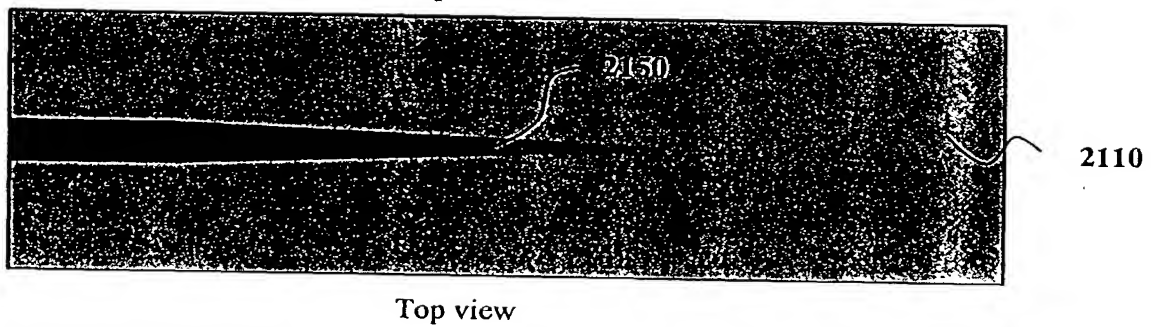
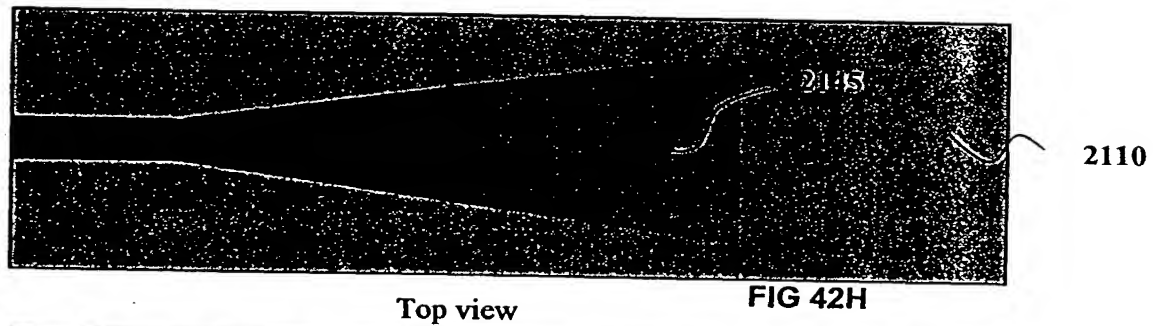
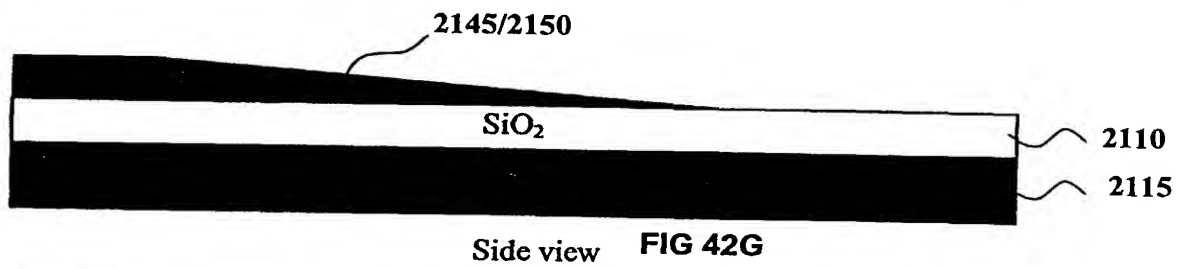
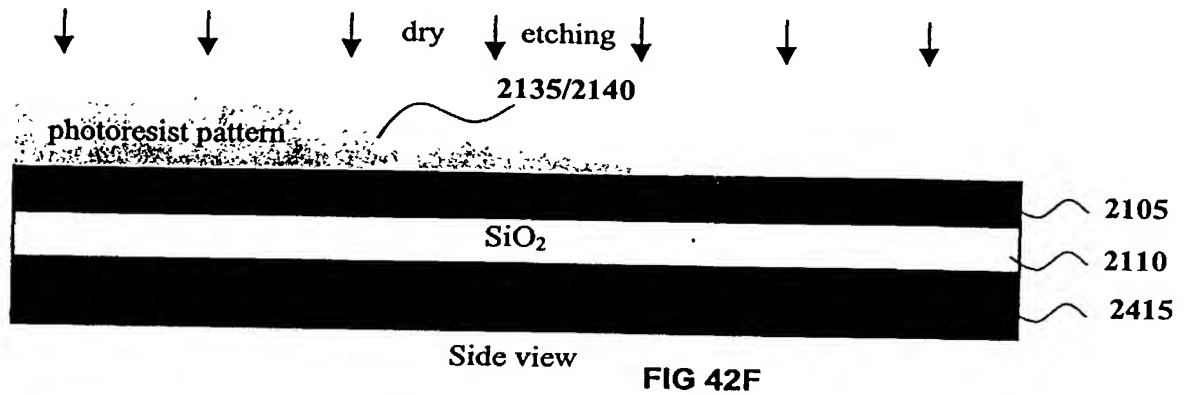
photoresist pattern top view

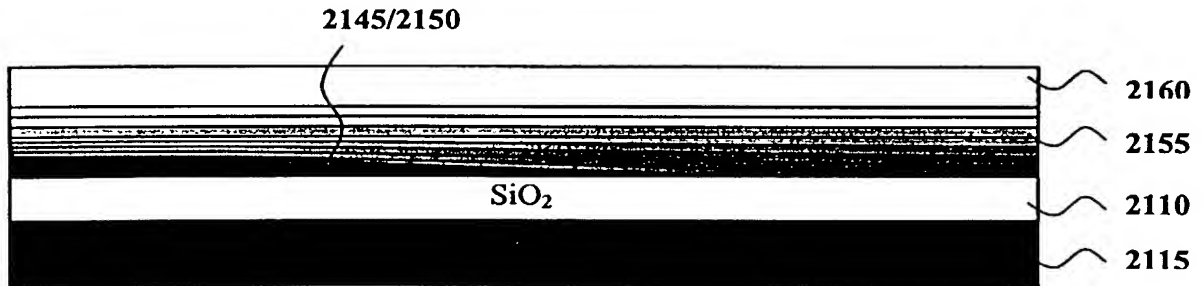
FIG 42D



FIG 42E

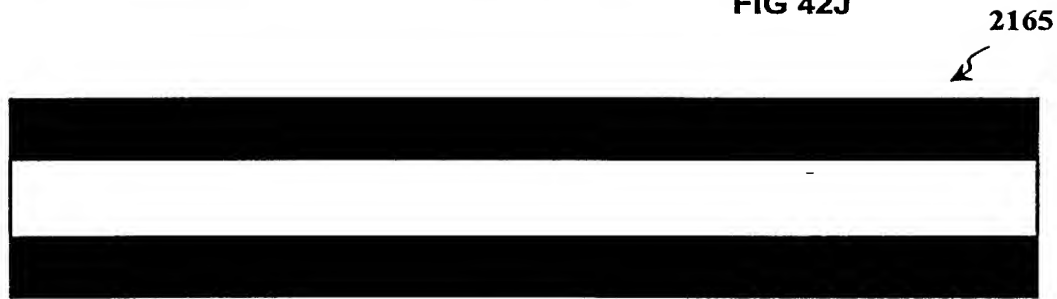
photoresist pattern top view





Side view

FIG 42J



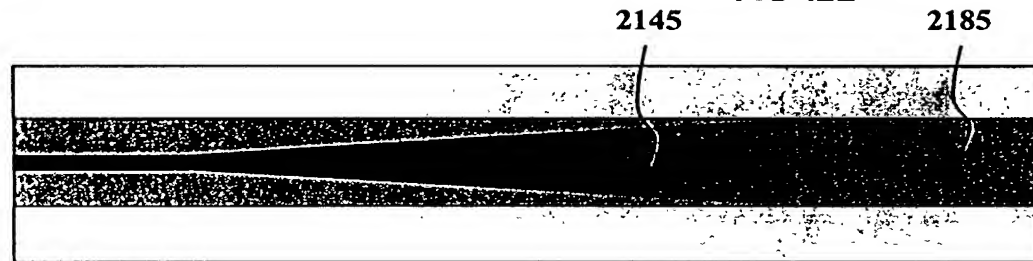
mask

FIG 42K



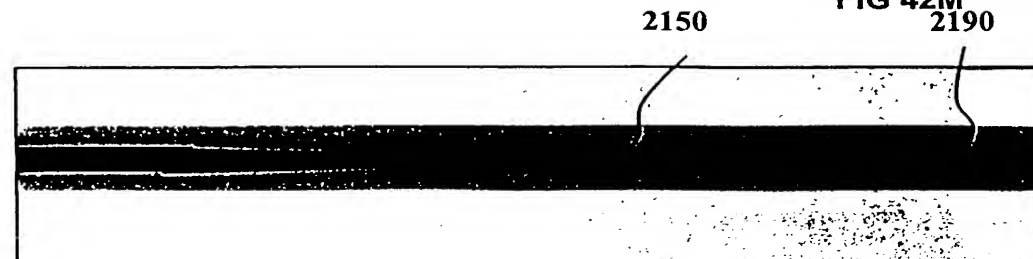
mask

FIG 42L



Top view

FIG 42M



2150

2190

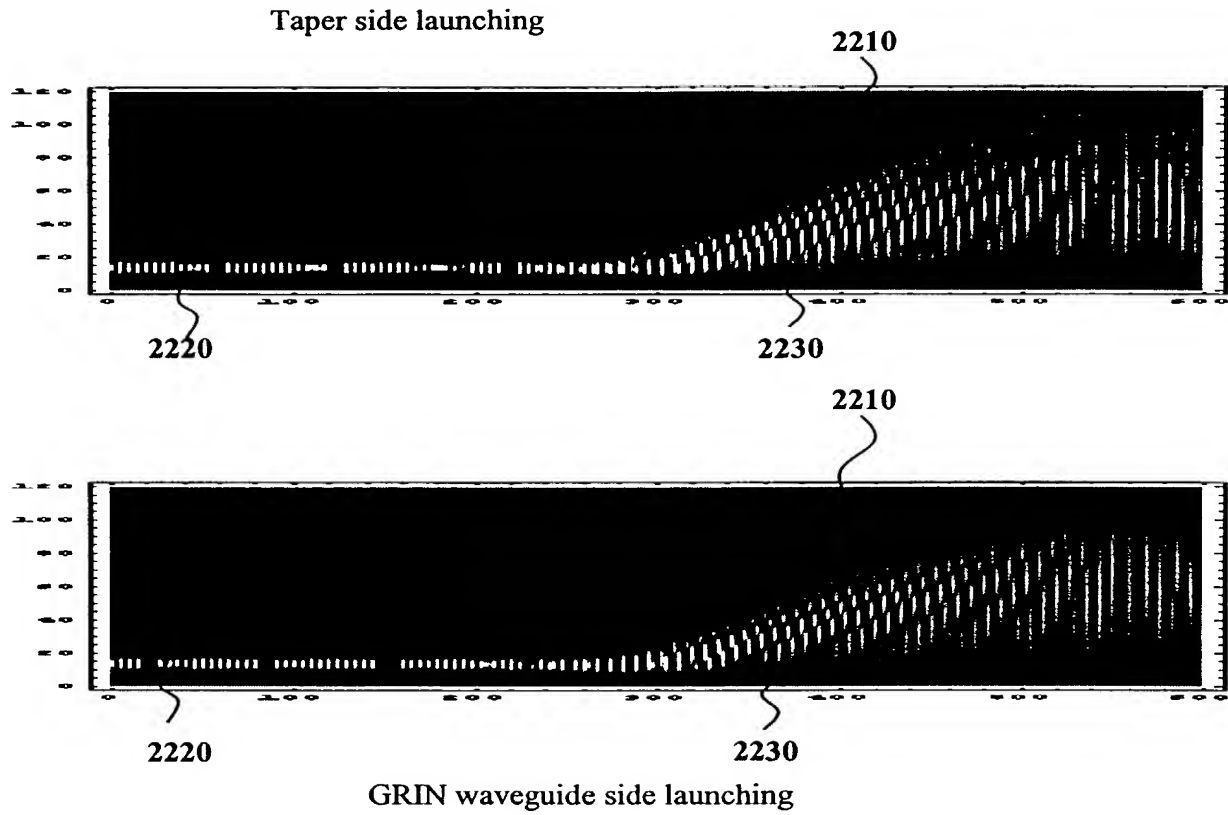


Fig 43

Atty. Docket No.: 021040-000300
 Applicant: Yan Zhou and Seng-Tiong Ho
 Title: INTEGRATED PLANAR COMPOSITE COUPLING STRUCTURES
 FOR BI-DIRECTIONAL LIGHT BEAM TRANSFORMATION...
 Sheet 56 of 59



FIG 44A

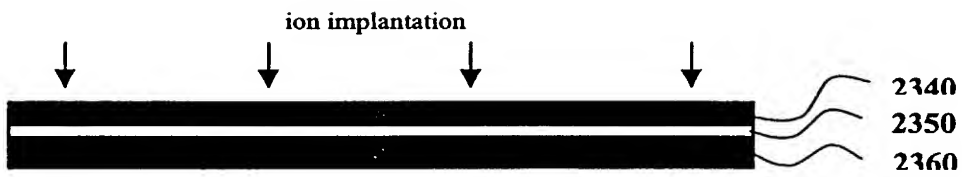


FIG 44B



FIG 44C

Fig 45A

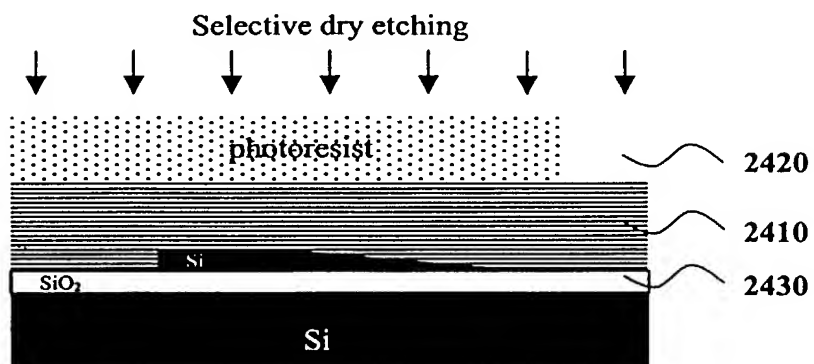


Fig 45B

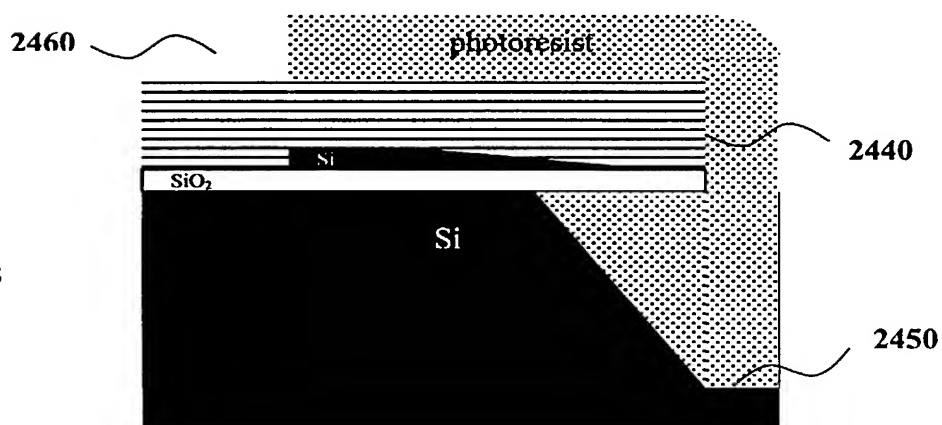
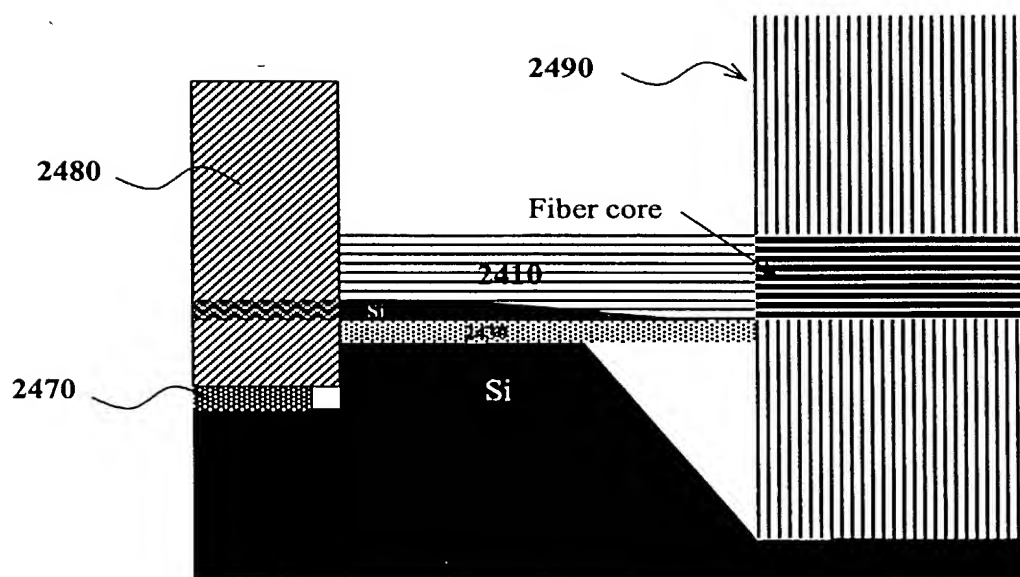


Fig 45C



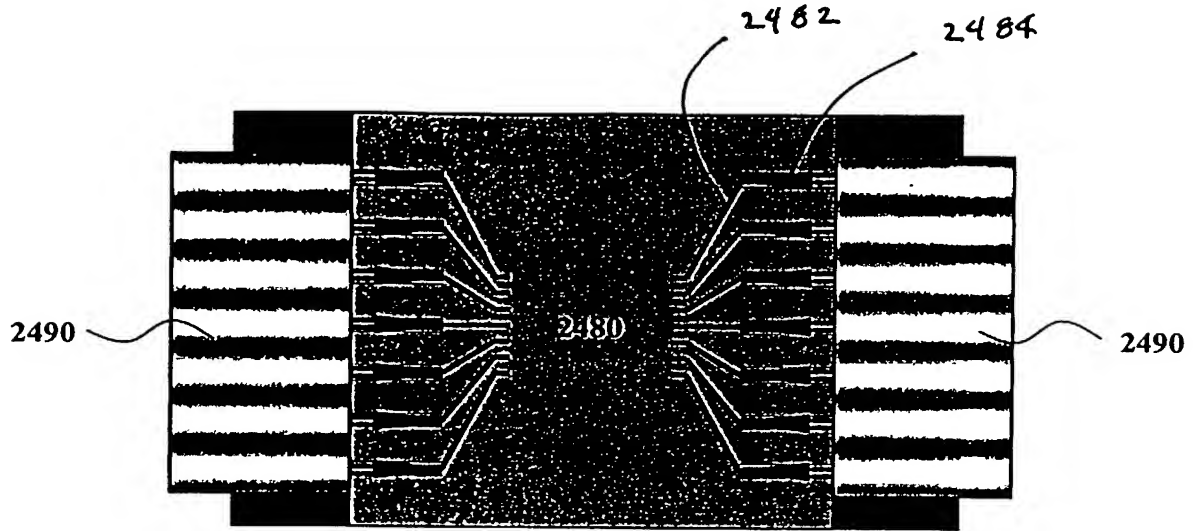


FIG 46

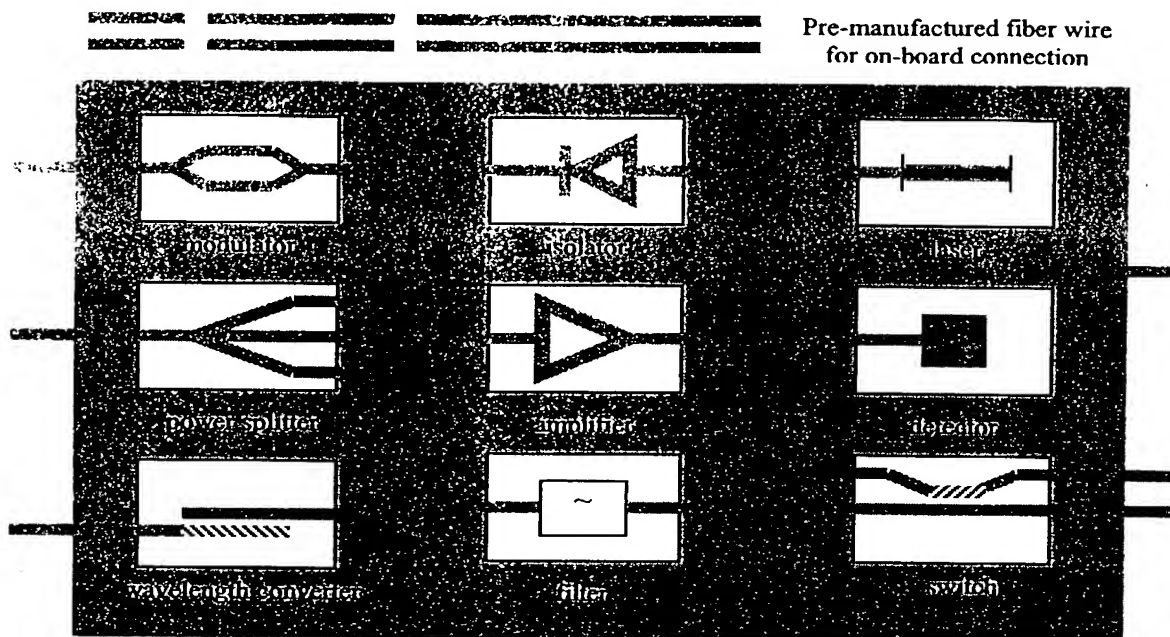


FIG 47